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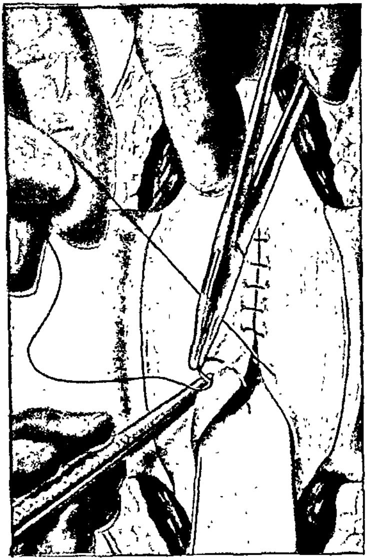

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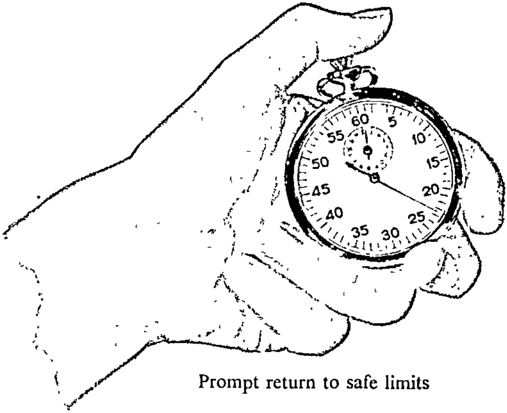

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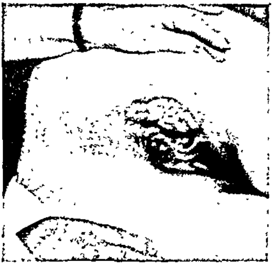
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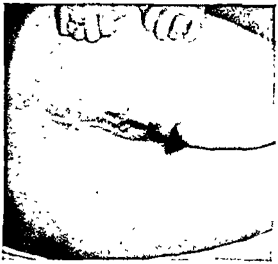
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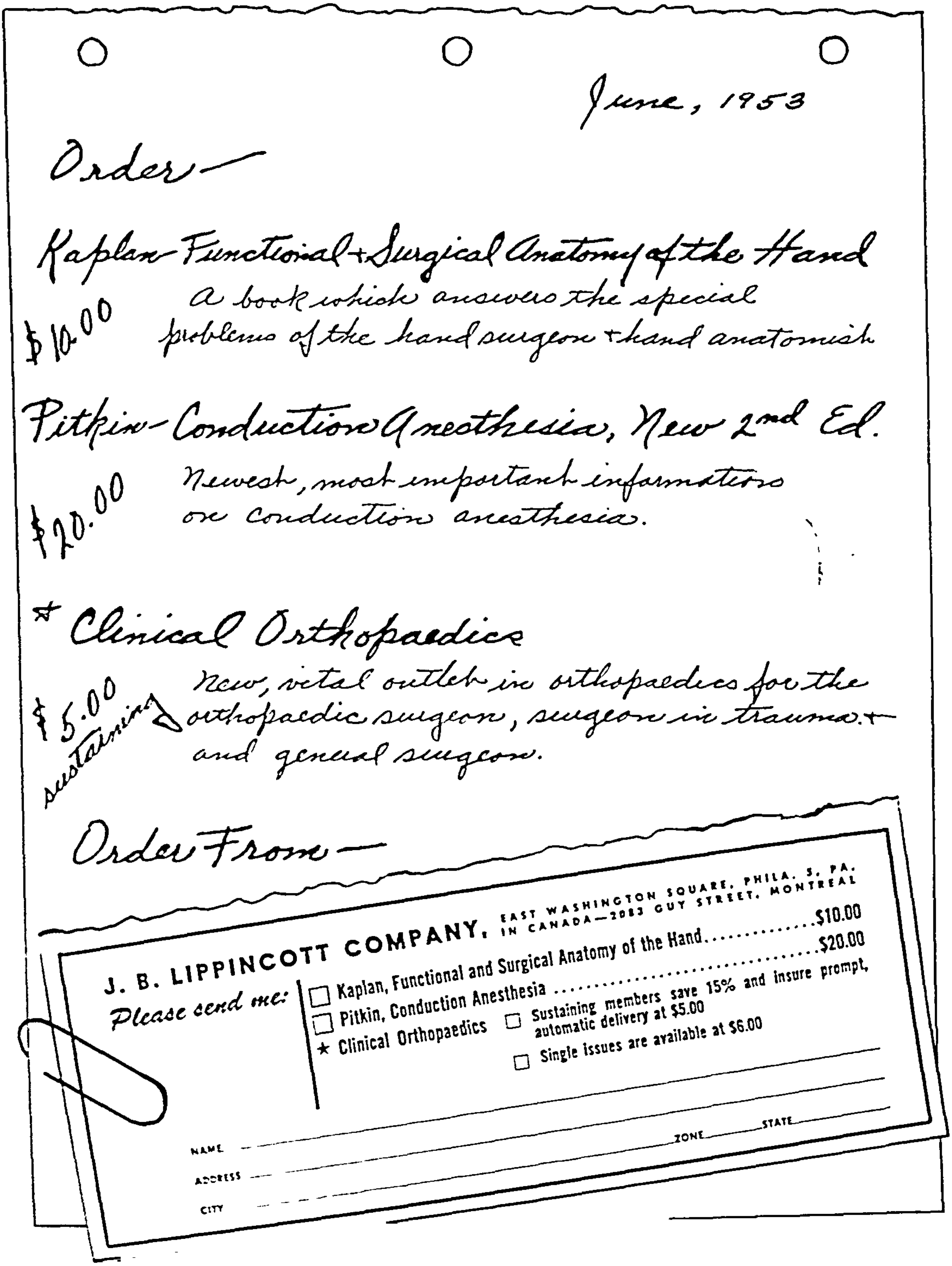

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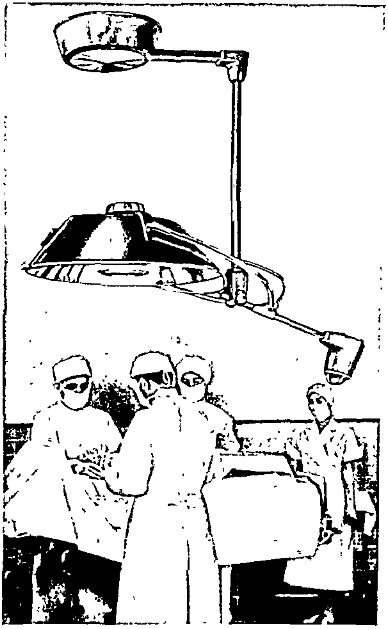

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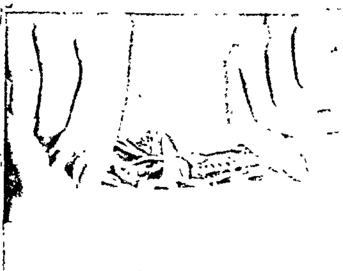

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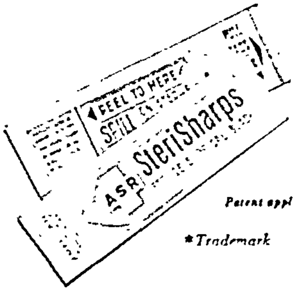

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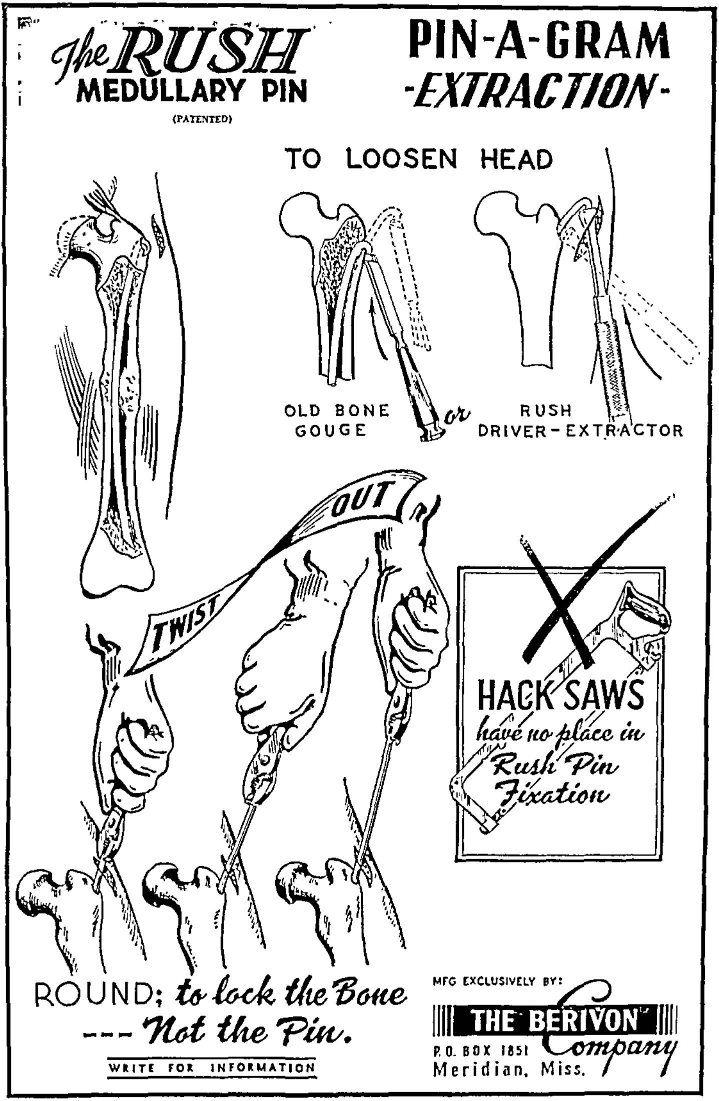

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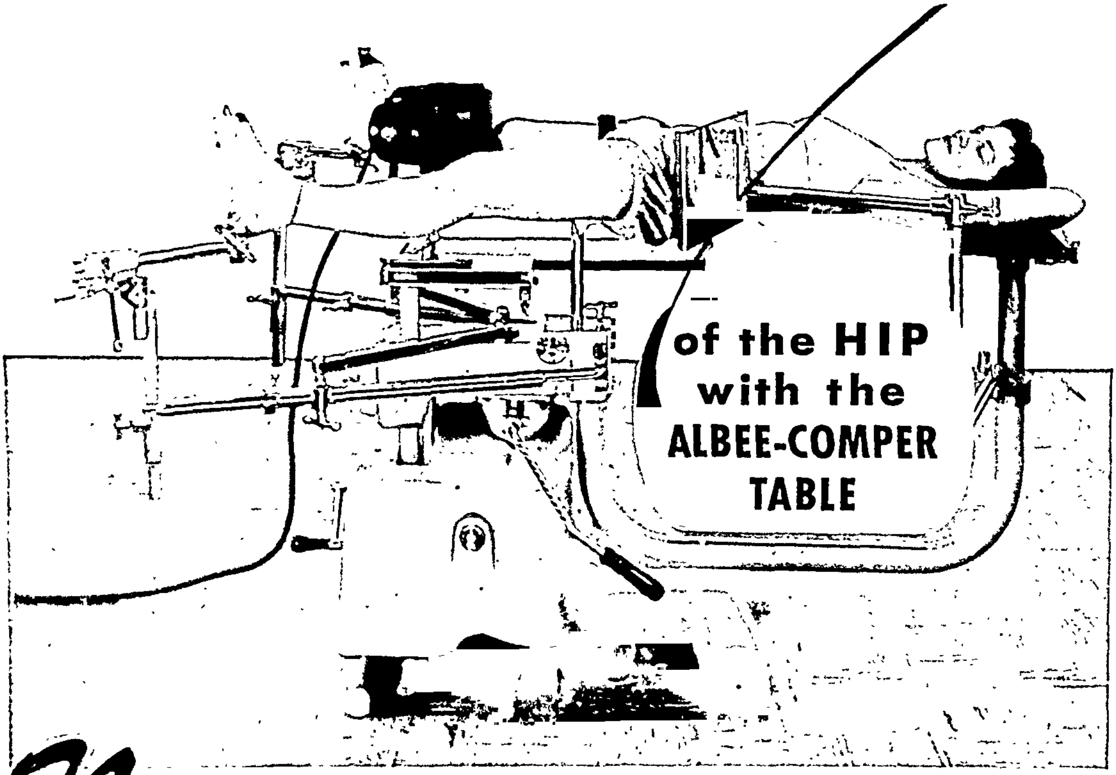

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COLLEGE INTERNATIONAL DES CHIRURGIENS

FOUNDED BY DR. MAX THOREK

The Journal of the
International College of Surgeons

FOUNDED IN GENEVA, SWITZERLAND, 1935 - INCORPORATED IN WASHINGTON, D. C., 1940

Vol. XIX JUNE, 1953 No. 6

Original Articles

Compression Granuloma of Spinal Cord Caused by Schistosoma Mansoni Ova; Epiconus; Conus Medullaris; Cauda Equina

Report of a Case

PROF. DR. CARLOS GAMA, M.D., F.I.C.S. (HON.)*

SAO PAULO, BRAZIL

IN 1945 I observed with J. Marques de Sá (of Recife, Pernambuco) a case of schistosomiasis of the spinal cord which was reported in the *Arquivo de Neuropsiquiatria* in São Paulo (vol. 3, pp. 334-336) and in Volume 4 of the *Annis da Faculdade de Medicina da Universitade da Bahia*, in the same year (1945).

At the time these reports caused great repercussions, mainly because of the rarity of this condition as an operative observation in a patient who was benefited by the surgical treatment.

During World War II the problem was much in evidence, and many important studies on schistosomiasis were reported. Several cases of granuloma of the central nervous system caused by Schistosoma mansoni ova were included.

E. C. Faust, of the Department of Tropical Medicine and Public Health, Tulane University, New Orleans, reviewing the literature in 1948 (*American Journal of Tropical Medicine*, vol. 28), cited 82 cases of granuloma of the central and peripheral human nervous systems, in 8 of which the tumor was in the spinal cord. Six tumors were discovered at autopsy; 1 diagnosed on clinical grounds, and 1 ported by myself in 1945, was de during operation.

A new case of schistosomiasis of

---

*Chief of the Neurologic Service, Santa Casa da Sao Paulo, Brazil.

Submitted for publication April 23, 1953.

spinal cord, with a granuloma caused by S. mansoni ova and with epiconus, conus medullaris and cauda equina also present, has been observed in my service at the Pavilhão de Neurologia da Santa Casa de São Paulo and is reported here. The patient came from the northern part of Brazil, where Schistosoma mansoni infection is enormously prevalent. (In the case reported in 1945 the patient also came from the northern part of the country.)

The report of the 1945 case carried a bibliographic review of schistosomiasis, and the main biologic features of the parasite as encountered in Brazil were discussed. The hypothesis set forth at that time as an explanation of the migration of the parasitic ova from the gastrointestinal tract to the spinal cord is still acceptable. This hypothesis, first suggested by Heldt and Meloney in 1928, was subsequently accepted and demonstrated experimentally by others—Gutierrez (at the Tenth Congress of the Argentine Society of Surgery), Giordanango and Luis Rocha Azevedo. Dogliotti studied variations of pressure in the epidural space, showing the influence of motion of the spinal column, particularly in forced flexion. For the particular case, this theory may be stated thus: Owing to the anastomoses of the sacral plexuses to the inferior arachnoidal plexuses, the negative pressure observed during the act of defecation may be responsible for migration of the ova, which, coming from the rectal veins and their neighborhood, may migrate to the lower portion of the spinal cord.

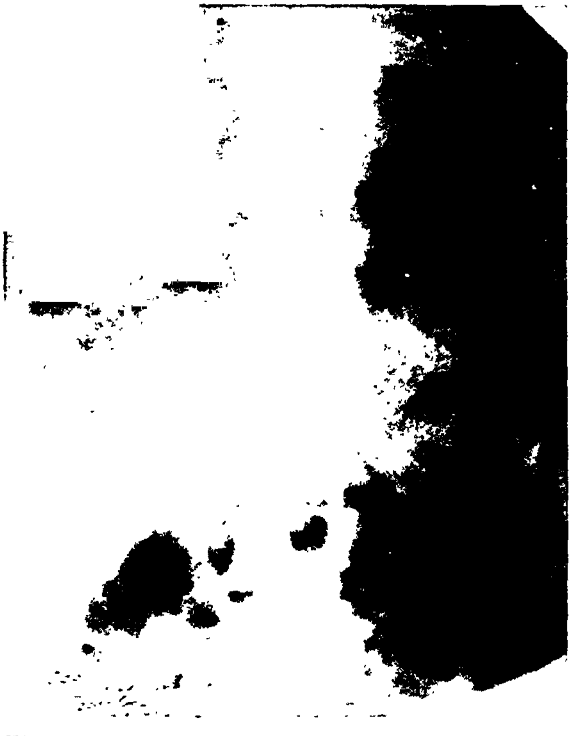

Fig. 1.—Perimyelogram taken after injection of 3 ml. of lipiodol into cisterna magna. Patient in orthostatic position. Note spinal block at twelfth thoracic level.

There is therefore no need to postulate a pulmonary cycle to explain the localization of Schistosoma mansoni ova in the spinal cord.

In the presentation of this new case, reference is made to new aspects of the organism's response to schistosoma infection.

REPORT OF CASE

M. S. P., an unmarried white welldigger aged 25, was admitted to the Sixth Infirmary M. H. of Santa Casa de São Paulo in January 1953, because of flaccid paraplegia, pain in the legs and disturbances of the urinary tract. He had been given urologic care for two months, with a diagnosis of neurogenic bladder.

The family history was noncontributory. The patient's birthplace was Barra da Estiva, Bahia. He had had a few falls from horseback, apparently without any injury. He had had a gonococcic infection four years prior to admission.

The illness for which he now sought relief had begun with constipation and difficult urination. Lately there had been complete retention of urine. He was unable to have a bowel movement without the aid of laxatives and enemas. One night at the cinema, on arising, he noticed weakness in both legs and reached home only with great difficulty. On the same night he began to have severe pain in the right leg, with a sensation of fever and headache. After the headache and fever subsided, he was unable to walk and continued to have "burning" pain in the right leg. Two months later the left leg began to be painful also.

Examination of the spinal fluid was done on February 27. On lumbar puncture the in-

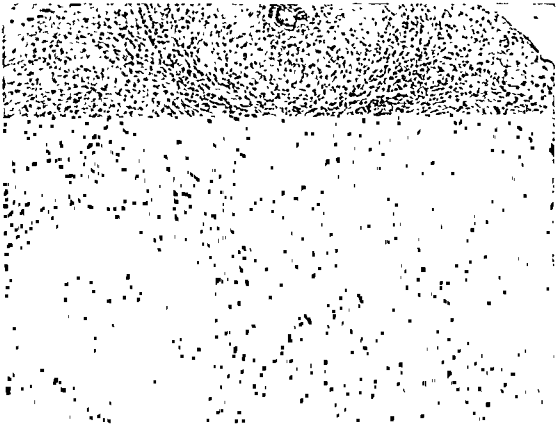

Fig. 2.—Section of tumor, showing isolated granuloma, with histiocytic reaction around a foreign body.

itial pressure, after withdrawal of 7 ml. of spinal fluid, was 20 mm.; the final pressure, 5 mm. The spinal fluid was limpid and xanthochromic, showing partial clotting in the tube. The Stookey test demonstrated spinal block.

The value for chlorides was 6.8 Gm. and that for total proteins 3.1 Gm. There were 6 white cells (lymphocytes) and 35 red cells per cubic millimeter. (The cytologic study was difficult, owing to the partial clotting.) The Pandy and Nonne Appelt reactions were positive.

The benzoin test revealed values of 12,221, 31,000, 12,200 and 0. The Takata-Ara test gave a positive result. The results of Wassermann, Eagle, and Steinfeld tests were negative, as were those of a test for cysticercus (Dr. A. J. Brandi, assistant, February 27).

Because of these observations the patient was transferred to the neurologic department on March 10. Neurologic examination on admission revealed a normal psychic state. There was loss of equilibrium, with falling to the left and backward. Walking was possible only with help, the patient being monoplegic and favoring the right leg, voluntary motion of which was limited and slow. The patient complained of pain during flexion and extension of the right leg, in which muscle power and tonus were diminished. The Mingazzini and Barré maneuvers showed fall of the right leg at 38 minutes.

Tendinous reflexes were present in both legs. A bilateral Babinsky sign was observed. Sensibility (pain, touch, vibratory) was diminished from the knee down and absent in the right ankle and fooot.

Perimyelographic studies were undertaken on March 12. The patient was examined roentgenographically after injection of 3 ml. of 40 per cent lipiodol into the cisterna magna. The lipiodol stopped at the lower thoracic region, where an arch image of caudal cavity was delineated at the level of the eleventh and twelfth interspaces. From each side downward a small, thin column of the contrast medium had formed, without reaching the bottom of the dural sac.

The spinal block having been confirmed and localized, a laminectomy was thought to be indicated and was performed on March 16, after suitable preoperative care.

Operation.—Anesthesia was augmented by tracheal intubation (Drs. Oswaldo Mariano and Kitiro Kumagai). The operation was performed by myself, with the assistance of Publio Salles Silva and J. A. Mattos.

The patient was placed in the ventral decubitus position. The twelf [illegible] the first and second lumbar [illegible] ·es

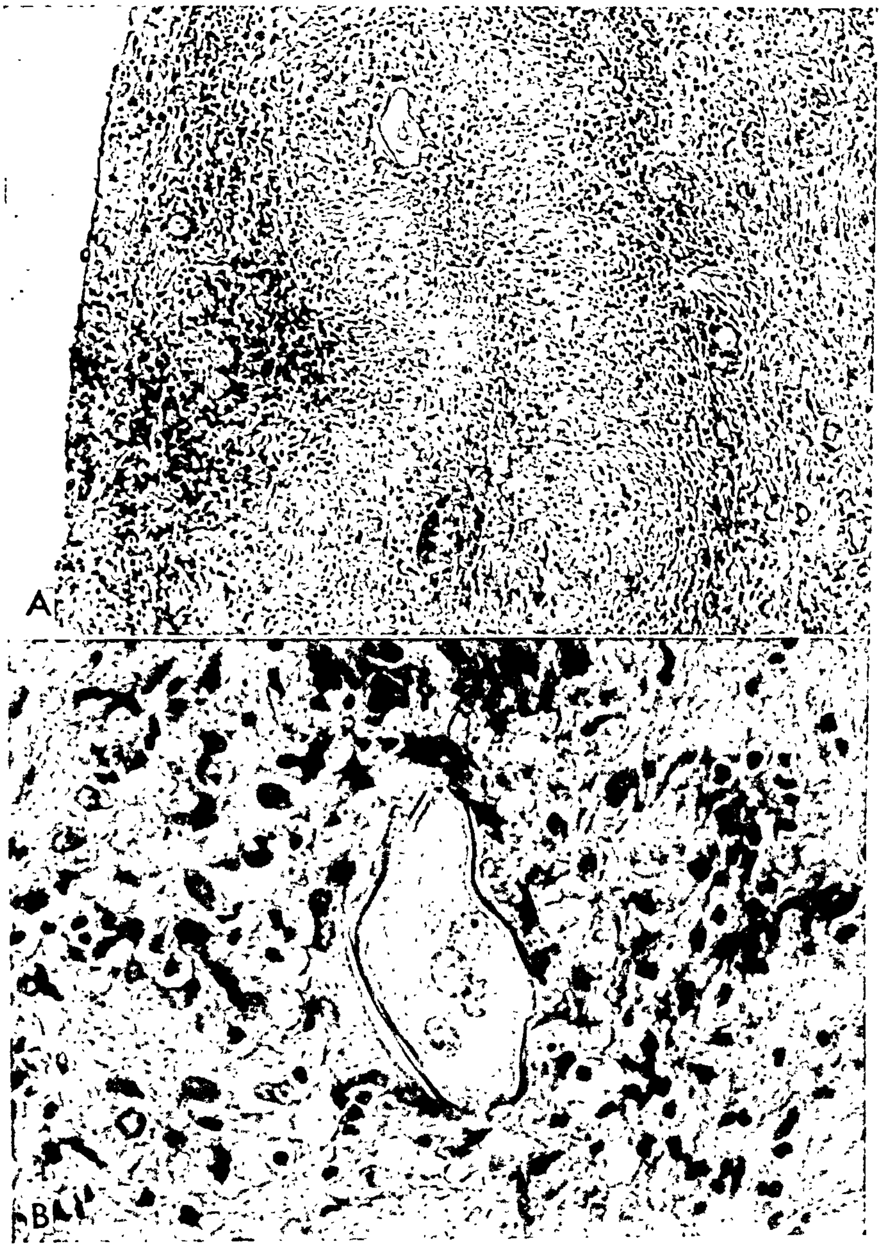

Fig. 4.—*A*, necrosis of coagulation areas surrounded by a histiocytic reaction, lymph-plasmocytic and eosinophilic infiltration. Two parasite ova are seen, one of them with typical lateral spicula. *B*, another S. mansoni egg with lateral spicula in the chitin membrane. A miracideo is seen inside.

rectal wall at biopsy, were dead and surrounded by a tuberculoid type of reaction. This observation agrees with the immunobiologic law of Levandowsky. In addition to the treatment aforedescribed, specific treatment (antimonial) was given.

Maffei has defended this theory with conviction in *Bases Anatomo-patologicas de Neuriatria e Psiquiatria,* Imprensa Methodista, São Paulo, Brazil, 1951, vol. 2, p. 22, as follows: "From the physiopathologic point of view the granuloma is a hyperergic response to an organic reaction to the invading agent, indicating fixation and great destruction of antigens." This is in agreement with the Levandowsky immunobiologic law of Levandowsky, which law states: When bacteria multiply in an organism without an inflammatory process and the bacteria are slowly destroyed by the action of the antibodies, nodules with tuberculoid structure may appear.

Careful urologic examination of the patient excluded vesical localization of S. mansoni ova, the urologic symptoms being probably due to an old gonococcic infection and repeated catheterization. Proctologic examination on the other hand, revealed ova of Schistosomo mansoni in the rectal wall, which is the usual habitat of the parasite.

The aspect of the granuloma revealed during the surgical procedure was so characteristic that despite its exceptional rarity the surgeon suspected it might be caused by S. mansoni ova.

Because of the incidence of the schistosoma infestation in certain areas where paraplegia is common, it is most desirable to consider schistosomosis of the spinal cord as a possible cause.

In a case in which there is clinical evidence of spinal cord block, perimyelographic studies should be done to determine more accurately the site of the block, and surgical attack is indicated regardless of whether the lesions are due to tuberculosis, syphilis or any other disease that may be considered a surgical problem.

Despite the fact that the case here presented is but the second to be reported in the world literature tumor of the spinal cord caused by Schistosoma mansoni ova discovered at operation, it is entirely possible that the incidence is greater than is supposed.

ZUSAMMENFASSUNG

Die Veröffentlichung des ersten Falles von Schistosomiasis des Rückenmarks enthält neben einer umfassenden Literaturübersicht eine Besprechung der wesentlichen biologischen Eigenschaften der Eier des in Brasilien vorkommenden Schistosoma mansoni. Ausserdem wird eine Hypothese zur Erklärung der direkten Wanderung der Eier vom Pfortaderkreislauf in den unteren Arachnoidalraum vorgeschlagen und die chirurgische Behandlung des Rückenmarkgranuloms gerechtfertigt, da es sich um eine echte Geschwulst des Rückenmarks handelt.

Die hier vorliegende Publikation des zweiten Falles eines durch die Eier des Schistosoma mansoni hervorgerufenen Rückenmarkstumors gibt einen weiteren Ueberblick über das einschlägige Schrifttum. Ferner wird eine sehr interessante Seite der auf die Infektion erfolgenden Organreaktion kurz erörtert.

Sowohl die im Rückenmark beobachteten als auch die durch Probeexzision aus der Mastdarmwand gewonnenen Parasiteneier waren tot und von Reaktionsgewebe tuberkuloiden Typs umgeben. Diese Beobachtung stimmt mit dem Levandowskyschen immunbiologischen Gesetz überein. Neben der oben erwähnten Behandlung wurde eine spezifische Therapie (Antimon) durchgeführt.

Maffei setzt sich mit Ueberzeugung für diese Theorie ein: "Vom physiopathologischen Standpunkt aus betrachtet stellen die Granulome eine hyperergische Folgeerscheinung der auf das Eindringen des Erregers erfolgenden Organreaktion dar und zeugen in Uebereinstimmung mit Levandowskys immunbiologischem Gesetz von Fixierung und umfangreicher Zerstörung von Antigenen." (*Bases Anatomopatologicas de Neuriatria e Psiquiatria*, vol. 2, p. 22. Imprensa Methodista, Sao Paulo, Brasil, 1951).

Levandowskys Gesetz lautet: Wenn sich Bakterien ohne Entzündungsvorgang im Körper vermehren und langsam durch die Aktion von Antikörpern zerstört werden, können sich Knötchen von tuberkuloidem Bau bilden.

Im vorliegenden Falle konnte durch sorgfältige urologische Untersuchung die Blase als Sitz der Schistosomaeier ausgeschlossen werden; die bestehenden urologischen Symptome waren wahrscheinlich durch eine alte Gonorrhoe und wiederholte

Katheterisierung bedingt. Die proktologische Untersuchung dagegen ergab das Vorhandensein der Eier in der Mastdarmwand, die gewöhnlich der Wohnsitz des Parasiten ist.

Der Anblick des bei der Operation freigelegten Granuloms war so charakteristisch, dass der Chirurg trotz der ungeheuren Seltenheit der Erkrankung den Verdacht auf eine durch Schistosomaeier entstandene Geschwulst hatte.

Da das Auftreten von Schistosomainfektionen in gewissen Gegenden beobachtet wird, in denen Lähmungen der unteren Extremitäten häufig vorkommen, erscheint es von Bedeutung, eine Schistosomiasis des Rückenmarks als mögliche Ursache in Betracht zu ziehen.

In Fällen, in denen eine Blockierung des Rückenmarks klinisch nachgewiesen werden kann, sollte durch myelographische Untersuchungen eine genauere Bestimmung des Sitzes der Erkrankung angestrebt werden; das chirurgische Vorgehen ist indiziert, gleichgültig ob die Erkrankung auf tuberkulöser, syphilitischer, oder anderer Aetiologie, die als ein chirurgisches Problem angesehen werden kann, beruht.

Wenn es sich auch im vorliegenden Falle erst um die zweite im Weltschrifttum berichtete Beobachtung eines durch Schistosomaeier hervorgerufenen Rückenmarkstumors, der bei der Operation entdeckt wurde, handelt, besteht doch durchaus die Möglichkeit, dass die Erkrankung häufiger auftritt, als im allgemeinen angenommen wird.

RÉSUMÈ

A l'occasion de la publication du ler. case de schistosomose médullaire au-dessus d'extense revision bibliographique, on a analysé des caractéristiques de la biologie du schistosome mansoni dans le Brésil une hipothèse ayant été défendue pour l'explication du passage direct des oeufs du système porte à l'arachnoidien inferieur, et justifié le procédé chirurgique dans le traitment des granulomes comme de vrais tumeurs medullaires.

En publiant ce 2è. cas de tumeur médullaire produit par des oefus d'schistosome mansoni, j'actualise et complète la bibliographie sur l'schistosomose et je mets en relief un aspect très intéressant des réactions organiques à l'infection.

Les oeufs du parasite trouvés dans la moelle, comme ceux qui ont été trouvés plus tard dans le matériel cureté des murs rectales, étaient morts et autour d'eux il y avait nue réaction tuberculoide.

On a homologué le matériel trouvé à la loi immunobiologique de Levandowsky, mais en dépit de cela, on a fait le traitement specifique antimoniale.

Maffei, W. E., défend cette théorie avec conviction, comme on voit dans "Bases Anatomo-patológicas da Neuriatria e Psiquiatria-Imprensa Methorista- São Paulo 1951, vol. II pag. 22.

"Au point de vue de la phisiologie pathologique, le granulome constitue l'expression hiperergique de la réaction organique à l'agent envahisseur, en indiquant la fixation et la destruction au plus haut dégré des antigénes par les anticorps, correspondant à la loi immunobiologique de Levandowsky."

Il convient que nous nous souvenons de cette lois: Quand les bactéries se multiplient libres de barrières dans l'organisme, celuici répond avec une inflammation inespécifique; quand les bactéries sont détruites lentement par l'action d'anticorps, des nodules de structure tuberculoide apparaissent.

Les méticuleuses recherches urologiques et practologiques dans le pacient, aprés l'opération, nous ont permis d'exclure la localization vésicale, étanet la sintomatologie urologique due à l'ancienne blennoragie et aux irritations des sondages et en outre, demonstrant la présence d'oeufs de schistosomes dans les murs rectales, d'ailleurs un habitat normal de ce ver.

Les méticuleuses recherches urologiques casion de l'intervention chirurgicale était si caractéristique qu'en dépit de l'exeptionnelle rareté, le chirurgien formula l'hypothèse de lésion produite par les oeufs de schistosome mansoni.

En consequénce de la grande incidence

de l'infestation par l'schistosome dans certaines régions où fréquenment les paraplégies sont désignées comme syphylitiques, il est convennable de penser aussi à l'schistosomose.

Dans le cas où l'épreuve de Stookey est positive pour le blocus, la perimologie avec le lipiodol doit être pratiquée, car dans ces cas, elle est l'unique capable de révéler avec netteté suffisante le tumeur.

L'arrêt du contraste confirmé dans un niveau en harmonie avec la sintomatologie clinique, l'intervention chirurgicale est indiquée, puisque dans ces conditions la tuberculose, la syphilis, comme la schistosomose, ou une autre infection quelconque devient passible de traitement chirurgique.

Quoique dans toute la littérature mondiale, ce cas soit le 2éme., de tumeur médullaire opéré et produit par des oeufs de schistosome mansoni, on doit admettre que l'occurrence puisse être plus fréquente.

COMENTARIO

En la publicación del primer caso de esquisostomiasis de la médula espinal agregado a una extensa revisión bibliográfica. Se discuten los rasgos biológicos de los huevos de S, mansoni en el Brazil. Se sugiere una hipótesis para explicar la migración directa de los huevos de la circulación porta al espacio subaracnoideo inferior. Se justifica el ataque quirúrgico sobre el granuloma de la médula espinal, ya que este es un tumor verdadero de la médula.

Al presentar este seundo caso de tumor de la médula espinal producido por S. mansoni se presenta una revisión bibliográfica sobre esquisostomiasis y se discute someramente un aspecto interesante de la reacción orgánica a la infestación.

Los huevos parásitos observados en la médula espinal, así como los obtenidos de la pared del recto en la biópsia estaban muertos y rodeados por una reacción de tipo tuberculoide. Esta observación está de acuerdo con la ley inmunológica de Levandowsky. Además del tratamiento anteriormente descrito se dió tratamiento específico (antimonial).

Maffei ha defendido con convicción esta teoría en "Bases Anatomo-patológicas de Neuriatria e Psiquiatria," Imprensa Methodista, Sao Paulo, Brazil, 1951, vol. 2, p. 22) : Desde el punto de vista fisiopatológico el granuloma es una respuesta hiperérgica a una reacción orgánica al agente invasor, indicando fijación y gran destrucción de antígenos, de acuerdo con la ley inmunológica de Levandowsky.

Esta ley establece: Cuando las bacterias se multiplican en un organismo sin un proceso inflamatorio y son lentamente destruídas por la acción de los anticuerpos, pueden ocurrir nódulos de estructura tuberculosa.

El examen urológico cuidadoso excluyó la localización de los huevos de S. mansoni en la vejiga, debiéndose los síntomas urológicos probablemente a una vieja infección gonocócica y a cateterización repetida. Por otra parte el examen proctológico reveló huevos de S. mansoni en la pared del recto, que es la localización usual del parásito.

El aspecto del granuloma demostrado durante la intervención quirúrgica fué tan característico, que a pesar de su rareza excepcional el cirujano sospechó podía ser producido por huevos de S. mansoni.

A causa de la incidencia de infestación esquistosomiásica en ciertas regiones donde la parapléjia es frecuente, es de desearse considerar la esquistosomiásis de la médula espinal como una causa posible.

En un caso en donde no hay evidencia clínica de bloqueo de la médula espinal, deben hacerse estudios perimielográficos para determinar más precisamente el sitio del bloqueo, indicándose el ataque quirurgico independientemente de que las lesiones sean debidas a tuberculosis, sífilis ó cualquier otra enfermedad que pueda ser considerada problema quirúrfiico.

A pesar del hecho de que el caso aquí presentado es el segundo comunicado a la literatura mundial, de tumor medular producido por huevos de S. mansoni descu-

bierto en la operación, es enteramente posible que la incidencia sea mayor de lo que se supone.

COMENTARIOS

Na publicação do *1° caso de esquistosomose medular*, alem de feito extensa revisão bibliográfica, foram analizados peculiaridades da biologia do *schistosoma mansoni* no meio brasileiro, defendida uma hipotese para explicação da passagem direta dos ovos do sistema porta para o aracnoidêo inferior, e justificada a conducta cirurgica no tratamento dos granulomas, como verdadeiros tumores medulares.

Ao publicar este 2° caso de tumor medular produzido por ovos de esquistosoma mansoni, atualiso e completo a bibliografia sobre esquistosomose, e resalto um aspecto muito interessante das reações organicas à infecção.

Tanto os ovos do parasita encontrados na medula, como os achados posteriomente no material curetado das paredes retais, estavam mortos, e em torno deles havia uma reação tuberculoide.

O achado foi homologado à lei imunobiologica de Levandowsky, mas a despeito disso fez-se o tratamento especifico antimonial.

Maffei, W. E. difunde, com convicção essa teoria, como se vê em Bases Anatomopatológicas da Neuriatria e Psiquiatria—Imprensa Methodista—São Paulo, 1951, vol. II pag. 22.

"Do ponto de vista fisiopatológico, o granuloma constitue a expressão hiperergica da reação organica ao agente invasor, indicando a fixa ção e destruição maxima do antigeno pelos anticorpos, correspondendo à lei imunobiológica de Levandowsky."

Vale recordar o enunciado desta lei:—Quando as bactérias se multiplicam sem barreiras no organismo, este responde com uma inflamação inexpecifica; quándo as bactérias são lentamente destruidas pela ação de anticarpos, originam—se os nodulos de extrutura tuberculóide.

As meticulosas pesquisas urológicas e proctológicas no paciente, depois, da operação, permitiram excluir a localização vesical, sendo a sintomatologia urológica devida à antiga blenarrogia e às irritações das sondagens, e por outro lado, a comprovar a presença de ovos de esquistosoma mansoni nas paredes reto-sigmoidianas, como é pró prio para "habitat" normal desse verme.

O aspecto do granuloma encontrado no ato cirurgico foi tão caracteristico, que a despeito da excepcional raridade, foi logo formulada pelo cirurgião a hipotese de lesão por ovos de esquistosoma.

Em consequencia da grande incidência da infestação pelo esquistosoma em certas regiões, onde são frequentes paraplegias rotuladas como sifiliticas, é recomendavel tambem pensar na esquistosomose.

Nos casos em que a prova de Stookey for positiva para bloqueio, deverá ser praticada a perimiclografia com lipiodol, única capaz de revelar com suficiente nitidez o tumor nestes casos.

Comprovada a parada do contraste em nivel condisente com a sintomatologia clinica, está indicada a intervenção cirurgica, pois nessas condições, tanto a tuberculose como a sífilis, a esquistosomose, ou outra qualquer infecção passa a ser passivel de tratamento cirúrgico.

A despeito de ser esse o 2° caso da literatura mundial de tumor medular operado, produzido por ovos de *schistosoma mansoni,* deve—se admitir que a ocurrencia possa ser mais frequente.

Volkmann's Ischemic Contracture[*] as a Complication of Supracondylar Fractures of the Humerus

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THE disfiguring deformity, with claw-like hand, shortened, fibrotic and dead flexor muscles of the forearm, often associated with paralysis and serious disability, was first described by Volkmann in 1869. He ascribed it to obstruction of the arterial blood supply, with concomitant loss of oxygen to the muscle tissue, venous stasis, coagulation and death of the muscle tissue. He considered tight bandages a factor in the production of the deformity and was not optimistic as to the results of treatment. Numerous reports of cases and contributions to the cause, pathologic aspects and treatment of the condition have been published since Volkmann's time, but no author has claimed a method of cure applicable to all types or degrees of this contracture.

My opinion is that the use of conservative measures, instituted early, may prevent or to a large degree limit the extent of damage to the nerves and muscles after the initial trauma. The extension type of supracondylar fracture of the humerus occurs most commonly in children; it is in such a fracture that Volkmann's ischemic contracture occurs with the greatest frequency. In a series of 128 cases I reported, the average age of the patients was 8.4 years; the incidence was greater (71 per cent) among boys; among girls it was 29 per cent. The humerus had been fractured in 62 per cent of cases. Unless it is corrected, the deformity and disability tend to become more evident; permanent loss of function may ensue.

The physician in charge of such a patient and the parents of the child concerned become much disquieted when treatment fails to bring about improvement, and they often seek consultation. The time that has elapsed since the infliction of trauma, the cooperation of the parents and the patient, the position of the fragments of the fractured humerus, the extensiveness of damage to the soft tissues and the thoroughness with which methods of treatment are carried out—all are important factors which influence the prognosis and results of treatment (Fig. 1, *a* and *b*).

Theories as to Cause. — When such a calamity occurs to a child, it is natural for the parents to demand an explanation for it. Unfortunately, in the past, parents have erroneously assumed that the physician in charge of the treatment was unskilled or negligent; such is often the basis on which malpractice suits are founded. I should like to emphasize the fact that Volkmann's ischemic contracture occurs in the presence of injuries and diseases which no physician has attended or for which no treatment has been given. How, then, is this explained?

When a fracture occurs, there are always hemorrhage, clotting of blood and a certain amount of trauma to the soft tissues. Arteries, veins and nerves may be torn or severed by movement of the sharp edges of the fractured bone, and the periosteum is always stripped away from the bone or is pierced, with extravasation of blood about the traumatized tissues. The posterior displaced position of the fractured condyles of the humerus pulls.

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[*] Also known as ischemic myositis, ischemic muscle atrophy, ischemic paralysis, ischemic contracture, Volkmann's contracture and Volkmann-Lesser paralysis.

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Custis Lee Hall Memorial Lecture read at the United States assembly of the International College of Surgeons, Chicago, Illinois, Sept. 4, 1952

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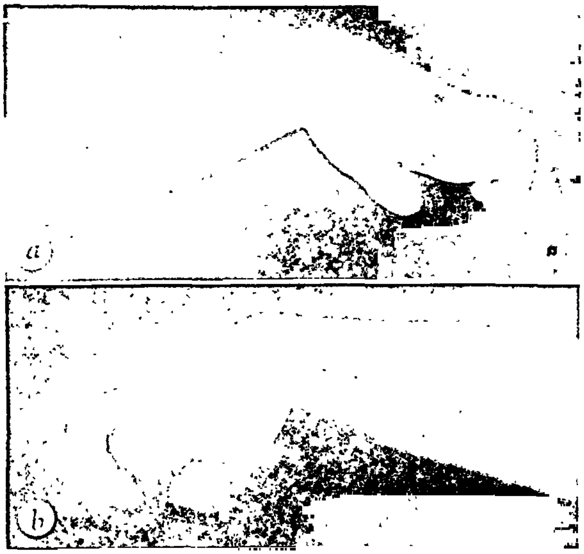

Fig. 1.—Volkmann's ischemic contracture in a boy 8 years old, after treatment of a supracondylar fracture of the humerus which was treated for acute flexion; *a*, inner aspect; *b*, outer aspect.

whereas the downward and forward displacement of the proximal fragment, with its sharp anterior edge, stretches and pushes, against the arteries and veins or pinches them against the structures of the forearm (Fig. 2). As a consequence, there are compression, laceration or even rupture of the blood vessels, and interference with normal circulation. The arteries, being thick-walled, are likely to permit a small amount of blood to flow, but the veins, being thin-walled, may when compressed be entirely closed.

The usual swelling and edema arising from blocking of lymph flow as a result of trauma in fracture at this site are aggravated when hematoma extends into the inelastic envelope-like structure surrounding the flexor muscles. These consist of the radius, the ulna and their interosseous membrane, the deep vaginal and superficial fascia, the skin and the biceps tendon inserting into the radius and the bicipital fascia. The brachial artery, passing under the bicipital fascia, and the veins and the median nerve of the antecubital area are thus also subjected to tremendous pressure. This intrinsic pressure, originating from the primary trauma, in itself is sufficient at times to cause extensive damage to the soft tissues and ischemic contracture, even though no treatment has been administered.

Rupture of the blood vessels and nerves has been observed at operation after trauma and fractures about the elbow—before manipulation, before the application of bandages or casts, and before the elbow has been placed in an angle of acute flexion after reduction of the fracture. Although it is true that hemophilia, Raynaud's disease, prolonged exposure to cold, osteomyelitis, embolism and infection sometimes are etiologic factors in Volkmann's ischemic contracture in adult persons, it is only rarely that these conditions play any part in Volkmann's ischemic contracture in children which occurs as a complication of supracondylar fracture.

Volkmann's Ischemic Contracture: Stage 1.—What are the symptoms that appear early and permit the physician to institute measures to prevent the deformity? Physicians are not always able to have their patients hospitalized under the watchful care of trained professional personnel who frequently can observe the circulation of the extremities. Hence, physicians often must depend on parents or relatives of the patient for care after the fracture has been reduced; the physician cannot neglect the other patients in his busy practice. This may mean that the patient is left comfortable, with adequate circulation after manipulation and the ap-

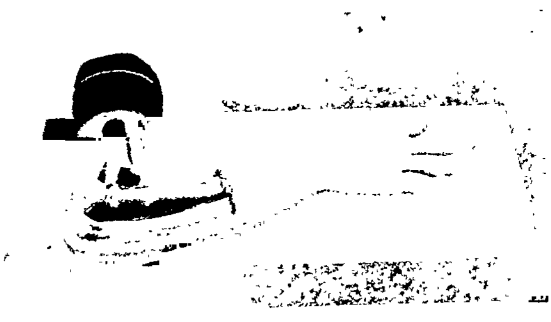

Fig. 2.—Moulage in an exhibit by the author, showing supracondylar fracture of the humerus with the distal fragment displaced posteriorly and the proximal fragment impinging upon the brachial artery.

plication of a retentive dressing, padded splints, a split plaster of paris cast or circular cast open over the antecubital area. The parents may be advised to call the physician should discoloration, swelling or pain become marked. On reexamination a few hours later, the fingers and hand may have become cyanotic and tender, cold and wet. Pain about the antecubital area may be increased, and the pulse may be faint or absent.

It is in this first stage, the early period, that prophylactic measures must be employed immediately, because the ischemia has begun and Volkmann's ischemic contracture can occur within a few hours. In a series I reported, 17.3 per cent of this type of contracture occurred within fifteen hours. Usually, when the dressing is loosened, all bandages are cut to the skin, and the elbow is partly extended; the pulse appears, and medicine for relief of pain is administered. This change of position in the presence of oblique supracondylar fractures of the humerus may relieve the symptoms, and an uneventful convalescence takes place. On the other hand, it is often the cause of slipping of the fracture, which means that the radial pulse may become feeble or may be absent. In such an instance, instead of experiencing relief of symptoms, the patient will complain more than before.

I have seen patients in whom this has occurred; remanipulation had been done several times by experienced surgeons, without relief of symptoms or proper reduction of the fragments. The making of repeated roentgenograms is of the utmost importance in determining the position when symptoms continue, because malposition is one of the contributing causes of intrinsic pressure and must be detected. In 40 per cent of the Volkmann's ischemic contractures I have seen, malunion was present (Fig. 3, *a* and *b*). I have had patients brought to me at this stage for consultation, together with the roentgenograms taken before and after attempted reduction, who showed evidence of slight contracture with feeble pulse, yet these patients have responded well to conservative nonoperative treatment.

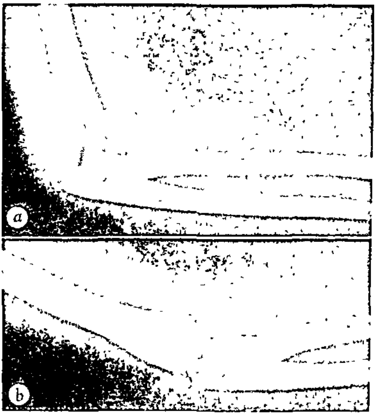

Fig. 3.—Roentgenogram *a*, of the arm of a boy 10 years old who sustained a supracondylar fracture of the humerus in 1924, showing malposition; *b*, view seven months later, after operation in which the fracture was reduced and internal fixation was carried out with two bone screws. The physician had brought the patient for examination because, when the arm was unflexed, the hand became swollen and cyanotic. The physician had been unable to reduce the fracture.

Volkmann's Ischemic Contracture: Stage 2.—A second stage may occur within a matter of hours or days. In a series of my own, 38.5 per cent of contractures taking place in this stage occurred within two weeks. When the retentive dressing, be it adhesive, splints or plaster of paris, has been left on for a week on more, an impaired radial pulse, pain, cyanosis and swelling may persist, with an increase of intrinsic pressure and some degree of degeneration of muscle tissue. Blebs may have appeared, sloughs may have occurred under the dressing and deformity may have become obvious. I have observed localized gangrene on removal of the fixation material within a few days after injury.

It is far better to suspend the arm by overhead traction and to apply warm, moist dressings about the elbow extended to 100 degrees than it is to attempt repeatedly to reduce the fracture and to maintain its reduction by acute flexion. Seventy-six per cent of patients with this type of contracture whom I have seen had had casts or splints, and 21 per cent had had bandages applied in flexion, before the occurrence of Volkmann's ischemic contracture. Jones emphasized the danger of treating these fractures by means of acute flexion. The exertion of traction through the olecranon by means of a Kirschner wire, with the elbow elevated on a soft pillow, may be an excellent manner of caring for the arm during such a period.

Collateral circulation may prevent gangrene and give some nourishment to the muscles, but should the symptoms persist in spite of the foregoing measures there should be no hesitation in obtaining expert consultation and resorting to surgical intervention. Drainage of the compressed areas under the deep fascia by longitudinal fasciotomy alone may give benefit. If the swelling is extreme it may be impossible to draw the skin together; in that event there would be danger of infection in the devitalized tissues. Antibiotic agents and modern aseptic surgical technic, however, have largely obviated the complication of infection.

The fracture may be reduced when fasciotomy is performed, or reduction may be postponed until swelling has subsided. It is my opinion that reduction and fixation of the condyles by means of Kirschner wires, screws, external pinning, or traction on the olecranon process are important in lessening the intrinsic pressure. A combination of procedures carried out at the time of operation in this stage of circulatory impairment, designed to reduce the fracture and to maintain reduction by internal fixation without use of the flexed position, and with fasciotomy and evacuation of the hematoma, is the treatment I prefer at this critical time. The surgeon, as well as the physician who has had charge of the patient from the time of injury, will be wise to keep a careful history, together with the physical observations; the presence or absence of the radial pulse, and the color and degree of swelling. The degree of paralysis, if present, should also be recorded. All roentgenograms should be preserved. Consultation is appreciated by members of the family, and a better appreciation of the gravity of the situation results when early expert advice is sought.

The ambulatory treatment of patients who have such fractures, with traction on the olecranon process or external pinning and the use of an airplane splint or a body cast, with the arm resting in a trough of plaster of paris, lessens the tendency toward swelling and is an excellent method of treatment. It can be employed immediately after fracture and reduction by the closed or open method, and after a period of recumbency following operations for the prevention or correction of the deformity of Volkmann's ischemic contracture. Why so many patients with fractures and associated impaired circulation are permitted to be ambulatory, in spite of obvious swelling and cyanosis aggravated by the arm's hanging at the side of the body and held in an acute flexion, is hard to understand.

Volkmann's Ischemic Contracture: Stage 3.—In this stage, some ossification is evident in the hematoma, the hand is numb and cold; the forearm shows some atrophy and is held in pronation; there is flexion and restriction of the elbow motion, and the clawhand deformity is evident. This stage may occur several weeks or months after the fracture; 44.2 per cent of instances of Volkmann's ischemic contracture in my series were discovered in this stage. The distal phalangeal joints are flexed, the metacapophalangeal joints are hyperextended, and when the flexed wrist is forced backward the fingers are drawn into the palm (Fig. 4). With the wrist acutely flexed, the fingers can be straightened. If the damage to the musculature is not too serious, the prognosis for return of function is good.

The treatment of choice is the use of Jones splinting and gradual extension, or one of the modifications of this method.

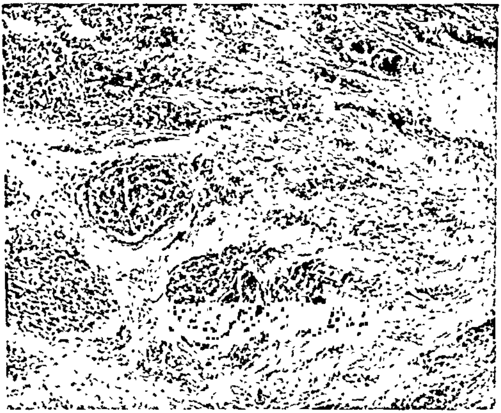

Fig. 4.—Degeneration and fibrosis of muscular tissue in an instance of Volkmann's ischemic contracture one year after the onset; ×75.

Jones advocated the use of formed zinc padded splints, applied with the patient's wrist flexed and the fingers straightened. Next, he extended the splints over the hand, thus holding the hand and fingers in the same plane. Finally, the splint was made to include the forearm. Gradual extension of the wrist and hand was obtained. Active exercises and physiotherapy should be employed, and the splints ought to be changed frequently. The principles involved in this method give excellent results.

I have employed modifications of the Jones treatment with great satisfaction, using such agents as the ever-available wooden-bladed tongue depressor or the banjo splint with elastic traction (Fig. 5). Numerous means of obtaining extension by special splints have been devised. The use of physical medicine must be stressed. Children with such contractures will respond to the kindly care of the physiotherapist and will cooperate if first given whirlpool baths and underwater exercises. Active and assisted exercise is not painful.

The traction and splinting should be done with the utmost care, so that the pressure on the devitalized tissues which might cause necrosis may be prevented. At this stage, when displacement is marked, fractures can be reduced by open operation or by traction through the olecranon process. I have operated in such cases by splitting the triceps posteriorly and, by means of a specially designed bone skid, levering the distal fragment into correct position, fixed it securely with bone screws or a Kirschner wire. During the procedure blood usually oozes from the antecubital space. Ossification takes place posteriorly, under the stripped-off periosteum at the distal end of the proximal fragment. After reduction of the fracture, the periosteum will fall against bone, and since there is little or no oozing, excessive thickness of the humerus is avoided. The operation decreases the intrinsic pressure in the antecubital space and between the fractured fragments under the stripped-off periosteum posteriorly. Intrinsic pressure in the forearm is further relieved by a long incision made medially to the palmaris longus muscle and extending through the deep vaginal fascia and blood

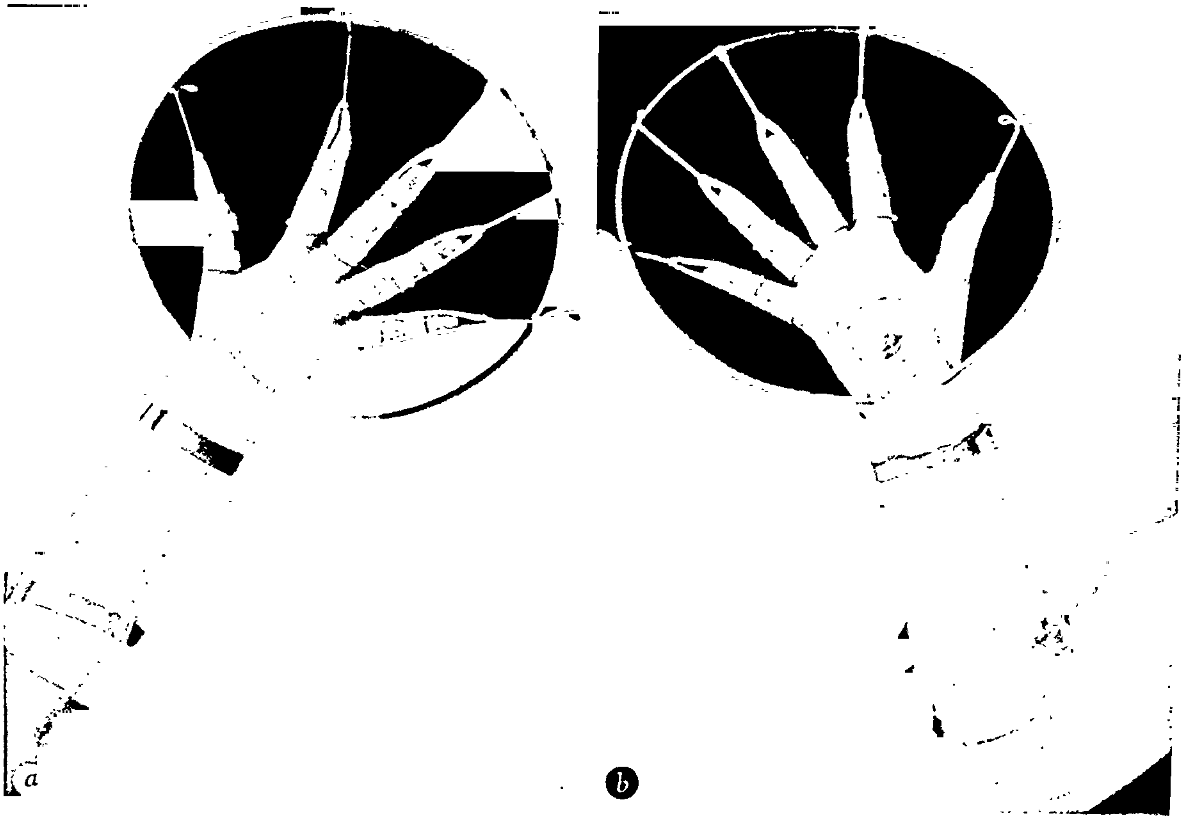

Fig. 5.—Author's method of using the banjo splint; *a*, outer aspect; *b*, inner aspect.

clot and necrotic tissue removed. The bicipital fascia may be sectioned and the brachial artery, which lies underneath it, inspected.

A well-padded moist alcohol dressing is loosely applied without splints or circular cast, and the arm is elevated on a pillow or suspended with the elbow on a pillow some active movements. Conservative physiotherapy is begun as soon as the wound is healed.

Volkmann's Ischemic Contracture: Stage 4. — The fourth stage occurs after months or even years have intervened since the time of injury. During the interim the deformity has persisted in spite of treatment and presents a problem that challenges the most expert surgeon. The degenerated, fibrotic and necrotic muscles may still contain some areas of viable tissue which, if given an opportunity, may recover function. There is atrophy of the entire arm. Growth in the length of the bone, with contracted capsules, restricts extension by the usual splinting or traction. Scars remaining from sloughs and adhesions compress what viable soft tissues remain, so that muscles, blood vessels and nerves cannot function normally.

It is now obvious that no operation can restore full function. On the other hand, salvage of some measure of function and improvement in the appearance of the arm by surgical measures and prolonged postoperative physical medicine is still possible. This is the period when the experienced and skillful surgeon offers the only hope. He will give his prognosis only after careful evaluation of what remains of the soft tissues. He knows he cannot promise complete return of function in such cases as these, in which the condition is of long standing. He will select the type or types of surgical procedure he thinks will permit correction of the deformity and restoration of a measure of usefulness in the arm and hand. The surgeon knows that without postoperative physiotherapy his efforts can rarely obtain the maximum of improvement. Splinting and traction are required to aid in, or to maintain, correction of position while early active and assistive movements are carried out. As the appearance improves, and as evidence of return of useful function comes to hand, the patients renew their efforts in cooperating with the surgeon. The color and the circulation in the parts improve; the hand may lose its clammy sensation; more blood reaches the muscles, and a degree of recovery of movement is achieved, all of which indicates that there was more residual functional tissue than was thought. I estimate that improvement in appearance and function followed treatment in 76 per cent of cases in my series.

Surgical Aspects: What are some of the surgical procedures that can be employed when the contracture is of long duration and deformity is extensive? I believe that tendon lengthening is the most useful of the surgical procedures. I have employed it with satisfactory results, always with postoperative splinting or traction and physiotherapy.

Through an anterolateral incision extending from the wrist upward, the skin and fascia are divided so as to expose the superficial and deep flexor muscles and tendons. Scar tissue and tight intermuscular fascia are excised; nerves, tendons and blood vessels are relieved of pressure from adhesions and tight superimposed fascia. Tendons are lengthened by two oblique incisions 2.5 cm. apart, three-fourths of the distance across the tendons. Stretching is done by opening a forceps passed underneath. All the contracted tendons are lengthened by this means. These muscles usually are the palmaris longus, flexor carpi radialis and ulnaris and pronator radii teres; or, in severe contracture, the flexor sublimis digitorum, the flexor longus pollicis and flexor profundus digitorum. Supination is treated by section or excision of the pronator radii teres and pronator quadratus muscles, manipulation and postoperative use of a supination splint.

Inspection of the brachial artery may show need for section of the bicipital fascia and may disclose scar tissue. If there is limitation of extension of the elbow, excision of the capsule anterior to the joint may help. Malunion, in which the distal fragment of the humerus is displaced posteriorly, often is the cause of impaired motion; osteotomy, with internal fixation in a normal position, may be of benefit. A tourniquet as a rule is not used, but if it is, it is applied only at intervals, and then just long enough to control bleeding. Generally, there is little bleeding in the scar-like tissue. The skin is sutured, and well-padded splints are applied to maintain the wrist and fingers in extension after forceful manipulation.

When this form of tendon lengthening is used, the tendons can be seen to tear and stretch sufficiently, yet strands of their fibrous tissue continue to hold them together. I have not found it necessary, after such tendon lengthening, to loosen the muscular attachments at the internal epicondyle. Traction with a banjo splint, with the use of adhesive to the fingers and rubber bands, is useful in gaining further extension if desired, and it permits the fingers to be exercised actively. After this method of care, and with the removal of splints, physical therapy can be carried out within a few days.

Convalescence is marked by the change in appearance of the arm, the improvement in color as a result of better circulation and an unlooked-for ability to move the fingers. Those in attendance should keep an optimistic and cheerful attitude throughout the treatment, cause no pain by the excessive use of force and have the patient note every change for the better as it appears.

Neurolysis is of benefit. Nerves may be lacerated or divided during the injury and displacement of the bony fragments; I have seen the median nerve completely severed. The contracture should not be attributed to damage to nerves when scars, adhesions and degeneration are obvious at operation. It is my opinion the condition of the nerves, unless they were injured at the time of the primary accident, in transportation or during manipulation, is secondary to the ischemia. The beneficial results of neurolysis may be partially due to the opening up of the tissues during operation and the after-care. A complete neurologic examination is indicated in every case of Volkmann's ischemic contracture. A record should be kept of the extent of paralysis and the time of its onset. When the tissues of the forearm are squeezed sufficiently by internal pressure and aggravated by tight splinting and unyielding circular dressings to cause death of the muscles, it is to be expected that there will also be a measure of nerve degeneration. In my series the radial nerve was most commonly involved.

Section of the common origin of the flexor muscles at the internal or mesial epicondyle and stripping them downward releases the contracture to some degree and may be combined with tendon lengthening when there is marked shortening. The usual postoperative stretching and physiotherapy are carried out.

In long-standing deformities the growth of bone may be sufficient to cause protrusion, and the wrist may be flexed to such a degree as to cause dislocation. The inelastic, cordlike muscle and tendons do not lengthen with the growth of the patient; they remain shortened. No sudden great force will lengthen them; the finger could be torn off before the contracted tissues would stretch. It is sometimes, though rarely, necessary to remove sufficient bone to obtain an extended wrist and hand. This may be done by resection of one or two rows of carpal bones or by removal of part of the radius and ulna. When resection of the carpal bones is performed, it is advisable to carry out arthrodesis of the wrist with a bone graft and to obtain an angle of extension of 20 degrees. Enough bone should be removed to allow the wrist to be placed in the desired position without great tension.

When fusion has occurred, the opportunity arises to use muscle transplantation. The exterior carpi and the supinator longus muscles may be transplanted to reinforce the weakened or useless flexor tendons of the fingers. In the United States orthopedic care is much more readily available than formerly, and such degrees of bone deformity as protrusion of the radius and ulna are rarely seen.

Operations for the relief of stiffness of the elbow in cases of long-standing Volkmann's contracture may require excision of scar tissue at the fold of the elbow. Sloughing in this area as a result of holding the arm in acute flexion, with resulting maceration, is not infrequent. Capsulectomy may be done if the capsule is involved. Malunion, in which the condyles unite with backward displacement, requires removal of a wedge-shaped piece of bone and internal fixation. Combinations of such procedures and even arthroplasty are sometimes needed to obtain a satisfactory result. Stiffness of the shoulder, with limited abduction and rotation, occurs; it is treated by manipulation and physiotherapy.

The benefits to be had from block of the stellate ganglion and sympathectomy appear to be gained when the condition is in an early phase.

Volkmann's Ischemic Contracture: Stage 5.—The fifth and last stage (Fig. 6) denotes the condition of those unfortunates who have lost all power to move the forearm, have extreme atrophy and suffer from trophic ulcers and temperature changes. The extremity is so useless and so unsightly that the patient actually might do better with a prosthesis.

REPORT OF CASES

Case 1 (Supracondylar Fracture Followed by Volkmann's Ischemic Contracture).—A boy 7 years old was admitted to the Mayo Clinic with a history of sustaining a supracondylar fracture of the left humerus three and a half months earlier. The fracture had been reduced immediately; anterior and posterior splints had been applied and held with adhesive. The arm had begun to swell; it became cold and turned black. The physician removed the splints fifteen hours later; three days later the patient was taken to another physician, who treated the arm with hot applications and elevation. Roentgenograms showed malposition of fragments. The arm was remanipulated. The parents were told that a blood vessel had been injured. The forearm became black, and the pulse was absent. Later the arm became swollen and open reduction was performed, after which splints were applied. One month after the original injury, flexion of the wrist and fingers was noticed; there was no treatment after these measures.

Examination at the clinic showed a scar posterior to the elbow; there was a large scar over the radial surface of the forearm, from pressure. Splints of the Jones type were applied, and the parents were advised to carry on further splinting and physiotherapy at home under their local physician's supervision. The patient was seen from time to time, and definite improvement was noted. Sixteen months later the parents wrote that there had been gradual improvement in the condition of the arm; there was more power in the flexors, and the size of the hand had increased.

Case 2 (Volkmann's Ischemic Contracture of the Right Arm After Supracondylar Fracture).—A boy 9 years old fell from a horse ten and a half months prior to his admission to the clinic. At the time of the fall he had sustained a supracondylar fracture of the humerus. His physician had made roentgenograms immediately, administered an anesthetic agent, reduced the fracture and applied splints with the elbow at right angles. So much pain and swelling had followed this treatment that it had been necessary to give anodynes for relief. When the splints were removed it was seen that sores had developed; the fingers and wrist were flexed and stiff, and the elbow could not be straightened. The patient had been brought to the clinic because of increasing deformity and disability of the right arm.

Examination disclosed a typical Volkmann's ischemic contracture, with 60 degrees of motion in the elbow. Conservative treatment, consisting of the gradual extension method and physiothrapy, were tried for seven weeks without definite improvement. Pressure sores developed. A consultation was held, after which the flexor tendons of the wrist and fingers were lengthened, and the hand and wrist were manipulated and put up temporarily in extension in a cast. After the operation the patient was discharged, showing decided improvement. He was advised to continue treatment at home.

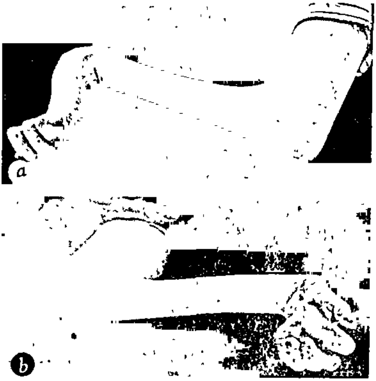

Fig. 6.—Two aspects of the arm of a patient 19 years old who had been treated ten years previously by bandaging of the fracture with the arm in acute flexion. This patient had received many forms of treatment, without benefit. There was no function in the arm, and the elbow and shoulder were stiff.

Case 3 (Volkmann's Ischemic Contracture of the Left Arm After Supracondylar Fracture).—A girl 9 years old was brought to the clinic with a history of having sustained a supracondylar fracture of the left humerus five years prior to admission. The fracture had been treated by acute flexion, but "swelling and blackness" caused removal of the dressings. A cast had been applied and removed at the end of six weeks. The left wrist and fingers became flexed and clawlike. Motion at the elbow was good. The patient had been taken to many physicians and had received much treatment, without benefit.

Examination showed the patient to have a typical Volkmann's ischemic contracture, with the wrist flexed to 170 degrees. Tendon lengthening was performed; the tendons were fairly free, and were lengthened with correction of the flexion deformity. A dorsal splint was applied. The patient showed definite improvement after operation and physiotherapy, and returned home. Twenty-eight nths later the father wrote that the o been successful, and that the le almost as good condition as the

Case 4 (Volkmann's Ische

of the Left Arm After a Compound Supracondylar Fracture). — A student 20 years old stated that eight years prior to his admission to the clinic he had sustained a compound, supracondylar fracture of the left arm. The arm had been placed in a cast immediately, after which pain and swelling of the hand and forearm had developed. On the fourth day the cast was split; blisters were seen on the wrist, and the fingers were flexed, with loss of sensation. The arm was kept in splints for two months.

Examination showed marked atrophy of the left forearm, limitation of motion at the elbow, right-angle contracture of the wrist and hyperextension of the metacarpophalangeal joints. The fingers were flexed. There were scars from pressure splints and atrophy and shortening of bone, which complicated the prognosis. A guarded prognosis was given.

At operation the tendons were found matted together in a firm mass. The median nerve apparently had been entirely destroyed by pressure. The wrist was brought out into extension with difficulty, after which the tendons were lengthened and splints applied. There was primary healing. Improvement of position resulted, and the patient was allowed to return home. He was advised to continue with physiotherapy. He returned here a year later, at which time he was delighted with the cosmetic result. He was able to drive a car and said he was able to do farm labor. Improvement continued.

Case 5 (Volkmann's Ischemic Contracture After Supracondylar Fracture, With a Functionless Left Arm).—A student 19 years old reported at the clinic, saying that he had fractured the left elbow in a fall from a bicycle ten years before. Tight bandages had been applied to the forearm for a week after the accident; during this time he had suffered severe pain and had cried continually. The dressings had been removed at the end of the week; blisters and open ulcers of the skin had developed. This contracture was of the most severe grade (fifth stage), and operation would have offered no benefit so far as improving the function of the hand was concerned. Amputation and the use of an artificial arm were advised.

SUMMARY AND CONCLUSIONS

Volkmann's ischemic contracture occurs most commonly as a complication of supracondylar fractures of the humerus in children. The acute flexed position of the elbow after reduction of the fracture is an important factor in increasing the intrinsic pressure of the arm.

Not one but several factors are involved in the production of Volkmann's ischemic contracture. These factors consist of injury in association with supracondylar fracture, intrinsic or extrinsic pressure or both, inhibited venous outflow while a slight arterial inflow continues, combined with immobilization, hematoma, lymph stasis and edema. These prevent oxygenation of the soft tissues of the forearm, with resulting degeneration, fibrosis and necrosis and replacement of the normal muscle by shortened inelastic scar tissue.

Constant care in maintaining an adequate circulation of the soft tissues is the most important prophylactic measure in the prevention of Volkmann's ischemic contracture during the treatment of children who have supracondylar fractures. The fracture should be accurately reduced and maintained in the corrected position without impairment of the circulation. To accomplish this, resort to skeletal traction or external or internal fixation may be necessary. The loosening of dressings and the removal of splints may result in displacement of the reduced fragments and result in malunion.

Roentgenograms should be made before and after reduction, in both the lateral and the anteroposterior position, and at intervals during treatment; these roentgenograms should be preserved.

Records as to the time of injury, physical observations and type of treatment used should be made; especial attention should be paid to the condition of the pulse, and evidence of paralysis, if present, should be recorded. The initial injury may have ruptured blood vessels or nerves. Volkmann's ischemic contracture can occur in cases in which no physician has seen or treated the patient; in such instances it is a result of trauma, fracture, hemophilia, infection or circulatory disease. Hematoma following an injury without fracture but with lymph stasis and intrinsic pressure produces edema which may be of such degree as to interfere with the blood supply. It thus causes degeneration, fibrosis or necrosis of the muscles. Reduction of the fracture may be temporarily delayed while measures to preserve the viability of the soft tissues are carried out. Function of the arm and hand is more important than perfect union of the fracture.

When a feeble or absent pulse persists in spite of changing of dressings and position of the elbow, no time is to be lost in resorting to surgical treatment. The most important benefits then result from the making of a long incision medial to the palmaris longus muscle, through the deep vaginal fascia, and drainage of the hematoma. Extension of the incision permits section of the bicipital fascia, inspection of the brachial artery and reduction of the fracture followed by internal fixation.

The treatment of Volkmann's ischemic contracture varies, depending on the interval since the time of injury, the degree of degeneration of the soft tissues, whether or not blood vessels and nerves have been ruptured, the degree of deformity and whether or not malunion is present. Various forms of treatment have been discussed. Emphasis is placed on the value of conservative measures, such as gradual stretching and physiotherapy.

ZUSAMMENFASSUNG

Die Volkmannsche ischaemische Kontraktur wird mein als Komplikation suprakondylärer Oberarmbrüche bei Kindern beobachtet. Die spitzwinklige Beugestellung des Ellbogens nach Einrichtung des Bruches spielt eine wichtige Rolle in der Erhöhung des inneren Druckes des Armes.

An der Entstehung der Volkmannschen ischaemischen Kontraktur sind aber eine Reihe von Faktoren beteiligt. Dazu gehören die mit der suprakondylären Fraktur einhergehenden Verletzungen, Druck von innen oder aussen oder eine Kombination von beidem, Behinderung des venösen Abflusses bei Aufrechterhaltung eines geringen arteriellen Zuflusses, Immobilisation, Bluterguss, Lymphstauung und Oedem. Diese Zustände beeinsraechsigen die Sauerstoffversorgung der Weichteile des Unterarms und führen zu Degeneration, Fibrose und Nekrose und zum Ersatz des normalen Muskels durch verkürztes unelastisches Narbengewebe.

Unablässige Aufmerksamkeit in der Erhaltung angemessener zirkulatorischer Versorgung der Wiechteile ist die wichtigste prophylaktische Massnahme zur Verhütung einer ischaemischen Volkmannschen Kontraktur während der Behandlung von Kindern mit suprakondylären Brüchen. Die Fraktur muss sorgfältig gesetzt und in guter Position gehalten werden, ohne dass der Blutkreislauf beeinträchtigt wird. Um das zu erreichen, muss man möglicherweise zur knöchernen Streckung oder zu äusserer oder innerer Fixierung schreiten. Lockerung der Verbände und Entfernung von Schienen kann bur Verschiebung der eingerichteten Bruchstücke und zur Nichtheilung führen.

Roentgenaufnahmen in seitlicher und sagitaller Strahlenrichtung müssen vor und nach der Einrichtung des Bruches und während der Dauer der Behandlung in gewissen Zeitabständen ausgeführt werden. Die Roentgenbilder müssen aufbewahrt werden.

Krankengeschichten mit Angabe des Zeitpunktes der Verletzung, mit Befunderhebungen und Angabe der angewandten Behandlung müssen geführt werden; besondere Beachtung muss dem Puls geisomes werden, und eswa ainforesanie Anzeichen von Lähmung müssen registriert werden. Die ursprüngliche Verletzung kann zur Zerreissung von Blutgefässen oder Nerven geführt haben. Eine Volkmannsche ischaemische Kontraktur kann bei Kranken auftreten, die nie von einem Arzt untersucht oder behandelt wurden; in solchen Fällen handelt es sich um die Folge einer Verletzung, eines Knochenbruches, einer Haemophilie, ei[illegible] Infektion oder einer Zirkulationss

aematom, las im Anschluss an eine ohne nochenbruch aber mit Lymphstauung nd erhöhtem inneren Druck eishcreshove Verlektung anffritt, ruft ein Oedem ervor, das gennegam umfangreich weren kann, um die Blutversorgung zu beindern. Auf diese Weise führt es zur egeneration, Fibrose oder Nekrose der uskeln. Die Einrichtung eines Bruches uss unter Umständen so lange aufgeschoen werden, bis Massnahmen zur Erhalung der Lebensfähigkeit der Weichteile usgeführt sind. Die Erhaltung der Funktion des Armes und der Hand ist wichtiger ls eine perfekte Heilung des Bruches.

Wenn trotz Wechsels der Verbände und er Stellung des Ellbogens der Puls chwach oder untastbar bleibt, muss unerzüglich zur chirurgischen Behandlung eschritten werden. Die günstigsten Erolge werden dann durch einen langen inschnitt medial vom M. palmaris longus urch die tiefe Sehnenscheidenfaszie und raenierung des Haematoms erzielt. urch Verlängerung des Einschnitts kann man die Faszie des Bizeps durchtrennen, die Brachialarterie freilegen, den Bruch inrichten und fixieren.

Die Behandlung der Volkmannschen schaemischen Kontraktur hängt von dem seit der Verletzung verstrichenen Zeitraum, vom Grade der Weichteildegeneration, vom Bestehen oder Nichtbestehen von Blutgefäss- oder Nervenzerreissungen, vom Grade der Entstellung und vom Eintreten oder Ausbleiben knöcherner Heilung ab. Verschiedene Arten der Behandlung werden erörtert. Besonders hervorgehoben wird der Wert knoservativer Massnahmen wie allmählich fortschreitender Streckung und Physiotherapie.

RIASSUNTO

La contrattura ischemica di Volkmann viene di solito osservata come complicazione delle fratture sovracondiloidee dell'omero nei bambini. La pasizione ad angolo acuto del gomito dopo riduzione della frattura è un fattore importantee di aumento della pressione interna del braccio.

Diversi sono i fattori etiologici della contrattura ischemica di Volkmann. Questi fattori sono: il trauma associato alla frattura sovracondiloidea, la pressione interna o estrinseca o entrambe, un impedimento allo scarico venoso mentre continua un lieve afflusso arterioso, la combinazione fra immobilizzazione, ematoma, stasi linfatica ed edema. Tali fattori impediscono l'ossigenazione delle parti molli dell'avambraccio, risultandone così degenerazione, fibrosi, necrosi e sostituzione del muscolo normale con un tessuto anelastico e cicatriziale.

La *più importante misura profilattica* della contrattura ischemica di Volkmann durante la cura di fratture sovracondiloidee in bambini è ilmantenere costantemente *una circolazione adeguata* nelle parti molli. La frattura deve essere accuratamente ridotta e mantenuta in posizione corretta senza ostacolo al circolo. Per ottenere questo può essere necessario ricorrere alla trazione trans-scheletrica o alla fissazione interna o esterna.

L'allentarsi della fasciature e la rimozione delle stecche può produrre lo spostamento dei frammenti ridotti e un consolidamento vizioso.

Si dovrebbero fare radiogrammi prima e dopo la riduzione, tanto in proiezione laterale che antero-posteriore, ripentendoli poi periodicamente durante la cura; questi radiogrammi dovrebbero essere conservati.

Bisogna tener conto del momento del trauma, dei segni fisici e del tipo di cura eseguito; bisogna porre speciale attenzione alle condizioni del polso e annotare, se presenti, eventuali segni di paralisi. Il trauma potrebbe aver leso vasi o nervi. La contrattura ischemica do Volkmann può verificarsi in malati che nessun medico ha visto o curato; in tali casi essa è il risultato di traumi, fratture, stati emofilici, malattie circolatorie o infettive. Un ematoma conseguente a una lesione sensa frattura ma con stasi linfatica e aumento della pressione interna produce edema che può essere di grado tale da ostacolare l'afflusso sanguigno. Esso quindi causa degenerazione, fibrosi, necrosi dei tessuti e dei muscoli.

Si può temporaneamente rimandare la riduzione della frattura mentre si mettono in opera le misure profilattiche per preservare la vitalità delle parti molli. La funzione del braccio e della mano è più importante di un perfetto consolidamento della frattura.

Quando il polso si mantiene debole o non ricompare anche dopo la rimozione dei bendaggi e il cambiamento di posizione del gomito, non si deve perdere tempo nel ricorrere al trattamento chirurgico. I risultati migliori si ottengono facendo una lunga incisione medialmente al muscolo lungo palmare attraverso la fascia profonda e drenando l'ematoma. L'estensione della incisione permette la sezione della fascia bicipitale, l'ispezione dell'arteria brachiale e la riduzione della frattura seguita da inchiodamento.

La cura della contrattura ischemica di Volkmann varia a seconda del tempo trascorso dalla lesione, del grado di degenerazione delle parti molli, a seconda se i vasi sanguigni o i nervi sono stati o no lesi, a seconda del grado di deformità e se sia o no presente un vizio di consolidamento. Vengono discussi i vari tipi di cura e viene dato particolar rilievo al trattamento conservativo come l'allungamento graduale e la fisioterapia.

RÉSUMÉ

La contracture ischémique de Volkmann est la complication usuelle des fractures supra-condylaires de l'humérus chez les enfants.

L'auteur repasse en détail toute la pathologie de cette affection. Il insiste sur les précautions à prendre pour maintenir une circulation adéquate après la réduction de la fracture. Ceci peut se faire par une traction sur le squelette. Des radiographies doivent être faites avant et aprés le traitement orthopédique à intervalles réguliers.

L'auteur donne aussi ses recommandations quant à l'état général du patient: surveillance du pouls, recherche de signes de paralysie, ruptures vasculaires, etc. De tous les traitements recommandés, le traitement conservateur doit être encouragé.

No uno, sino varios factores se encuentran complicados en la producción de la contractura isquémica de Volkman. Estos factores consisten en lesión asociada con fractura supracondilar, presión intrínsica ó extrínseca ó ambas, inhibición del aflujo venoso mientras que un ligero aflujo arterial continúa, combinado con inmovilización, hematoma, estasis linfático y edema. Esto previene la oxigenación de los tejidos blandos del antebrazo con la degeneración consiguiente, fibrosis y necrosis así como remplazameinto del músculo normal por tejido cicatricial inelástico y acortado.

La medida profiláctica más importante en la prevención de la contractura isquémica de Volkman durante el tratamiento de niños con fracturas supracondilares es el cuidado constante del mantenimiento de una circulación adecuada a los tejidos blandos. La fractura debe ser reducida adecuadamente y mantenida en la posición correcta sin perturbación de la circulación. Para llevar a cabo esto puede ser necesario acudir a la tracción esquelética ó fijación externa ó interna. El aflojamiento de los apósitos y la supresión del enyesado puede producir desplazamiento de los fragmentos reducidos y unión viciosa.

Deben hacerse roentgenogramas antes y después de la reducción, en ambas posiciones, lateral y anteroposterior, y a intervalos durante el tratamiento. Estos roentgenogramas deben ser conservados.

Deben hacerse registros sobre el tiempo de la lesión, observaciones físicas y tipo de tratamiento, debe ponerse atención especial al estado del pulso y evidencia de parálisis, si esta se encuentra, debe ser registrada. La lesión inicial puede haber lesionado vasos ó nervios. La contractura isquémica de Volkman, puede ocurrir en casos en los cuales ningún médico ha visto ó tratado al paciente, siendo un resultado del trauma, fractura, hemofilia, infección ó enfermedad circulatoria.

El hematoma consecutivo a una lesión sin fractura, pero con estasis linfático y presión intrínseca puede ser de tal grado, como para interferir con la vasculariza-

ción, produciendo degeneración, fibrosis ó necrosis de los músculos. La reducción de la fractura puede ser demorada temporalmente mientras se instituyen medidas para la conservación de la viabilidad de los tejidos blandos. La función del brazo y la mano es más importante que la unión perfecta de una fractura.

Cuando a pesar del cambio de apósitos y la posición del codo persiste un pulso débil ó no puede ser apercibido el pulso, no debe perderse tiempo para acudir al tratamiento quirúrgico. Los beneficios más importantes resultan de una incisión larga, interna al músculo palmar mayor, a través de la fascia profunda y drenaje del hematoma. La extensión de la incisión permite la sección de la fascia del bíceps, inspección de la arteria braquial y reducción de la fractura seguida de fijación interna.

El tratamiento de la contractura isquémica de Volkman varía, dependiendo del tiempo transcurrido desde la lesión, el grado de degeneración de los tejidos blandos, la presencia ó ausencia de lesión de vasos sanguíneos y nervios, el grado de deformidad y la presencia ó no de unión viciosa. Han sido discutidas varias formas de tratamiento. Se hace énfasis sobre el valor de las medidas conservadoras, tales como el valor del estiramiento y la fisioterapia.

SUMÁRIO

A contractura isquêmica de Volkmann é mais comumente observada como complicação das fraturas supra-condilares do humero na criança.

Não apenas um, poréem inumeraos fatôres, se reunem na produção da chamada sindrôme de Volkmann; consistem êles em lesão associada a fratura supra-condiliana; pressão intrinseca ou extrinsêca, ou mesmo ambas associadas; perturbações de circulação venosa e arterial; imobilização; hematôma; estase linfatica; edêma. Tudo isso cuita a exigenação dos tecidos moles do ante-braco, resultando a degeração, fibrose e necrose, com todas as perturbações musculares conhecidas.

Os constantes cuidados na manutenção de uma circulação adequada das partes moles são os meios profiláticos mais eficazes na prevenção da contractura isquêmica de Volkmann nas crianças acometidas de fraturas supra-condilianas do humero. A fratura deve sêr cuidadosamente reduzida e imobilisada em posição correta sem qualquer prejuizo para a circulação.

Radiografias devem sêr feitas antes e após a redução da fratura, nas posições lateral e antero-posterior, repetindo-se estas, com intervalos, durante o tratamento.

A observação deve sêr bem cuidadosa, observando-se o tempo da lesão, exame fisico cuidadoso, tipo do tratamento feito, etc. Uma especal atenção deve sêr dada ao tipo do pulso. A lesão inicial pode ter provocado rutura de vasos sanguineos e nervos. A contratura isquêmica de Volkmann pode ocorrer em casos em os quais nenhum medico vio ou tratou dos doentes; em tais casos é resultado de traumatismo, fratura, hemofilia, infecção ou doença circulatória. Um hematôma consequente a uma lesão, sem fratura, porém com estase linfatica e pressão intrinsêca produz edema que pode, em certos graus, interferir na circulação sanguinea, causando degeneração, fibrose ou ncrose dos musculos. A redução da fratura deve sêr temporariamente abandonada enquanto medidas para preservação dos tecidos moles são adotadas. A função do braço e da mão é mais importante que a perfeita-redução de uma fratura.

Não se deve perder tempo quando persiste um pulso debil ou mesmo ausente, adotando-se logo um tratamento cirúrgico. Beneficios os mais importantes resultam quando se procede uma longa incisão mediana sôbre o musculo longo-palmar, através o fascia profundo, drenando-se o hematoma. A extensão da incisão permitirá a a secção do fascia bicipital, a inspeção da arteria braquial e a redução da fratura através fixação interna.

O tratamento da contratura isquêmica de Volkmann varia, dependendo da duração e do tempo da lesão, do grau da degeneração dos tecidos moles, de existirem ou não lesões de vasos sanguineos e nervos, do grau da deformidade, e, tambem, da

existencia ou não de separação óssea. São discutidas as varias formas de tratamento, sendo realçados os meios conservadôres, tais como a distensão gradual e a fisioterapia.

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NINTH INTERNATIONAL CONGRESS, 1954

Under the Sponsorship of the Brazilian Government

Notice to All Members of the International College of Surgeons:

The House of Delegates on May 9, 1952, in Madrid, Spain, decided that the City of São Paulo would be the meeting place of the next International Congress, approving the suggestion of His Excellency the Governor of the State, Prof. Dr. Lucas Nogueira Garcez. Brazilian members of the Board of Trustees were appointed to the Commission organizing the Congress, under the direction of Prof. Dr. Carlos Gama, Vice-President of the International Congress and Secretary General for South America.

The Ninth International Congress will be held from April 26 to May 2, 1954. The official topics are (1) experience with socialized medicine in different countries, (2) new uses of radiology with contrast media in the various surgical specialties, and (3) experience with antibiotics in all branches of surgery.

Since the Ninth International Congress will coincide with the Fourth Centennial of the city of São Paulo, it is hoped that the conference, in addition to being one of the most memorable ever held, will add much to the commemorative activities of São Paulo. In order that the Commission may obtain in advance a satisfactory idea of the number who will attend, to arrange the best possible accommodations for them and to insure that the program shall be absolutely functional, all who are interested are requested to write to the address below.

—Prof. Dr. Carlos Gama, Secretaria, Praca Ramos de Azevedo, 7.°
Andar, Sala 710, São Paulo, Brazil.

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Total Pancreatectomy

ICHIO HONJO, M.D., AND CHISATO ARAKI, M.D., F.I.C.S.*
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A REVIEW of the literature concerning total pancreatoduodenectomy shows that in only a small number of cases was operation performed with a survival of more than three months.[1] Even in recent years, surgeons rarely have dared to try this operation, as the final outcome is not sufficiently predictable.

I have, therefore, attempted to make a comparative study of the postoperative physiologic changes in men with those in dogs, in order to evaluate the applicability of this operation in men.

At first, a brief remark in connection with the operative procedure used may be mentioned.

It is needless to say, if one wishes to obtain accurate data on total pancreatectomy, the pancreas should be extirpated alone and the neighboring organs left intact. However, the pancreas is anatomically so closely related to the duodenum that complete removal of the former without causing necrosis of the latter is nearly impossible.

If, to avoid the necrosis, one leaves some part of the pancreatic head attached to the duodenum, the postoperative physiologic picture is not equal to that observed after total pancreatectomy. In addition, the clinical indication for total pancreatectomy is usually a malignant

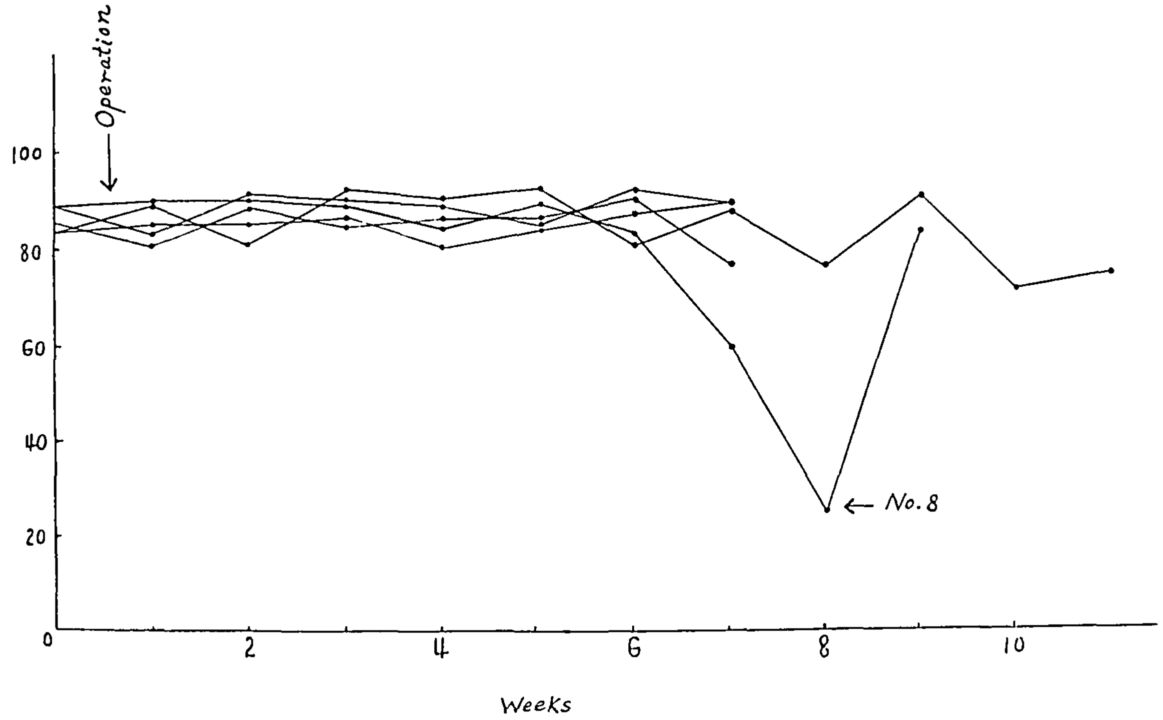

CHART 1.—The ester cholesterol—total cholesterol ratio in totally pancreatoduodenectomized dogs under the administration of methionine and pancreatin.

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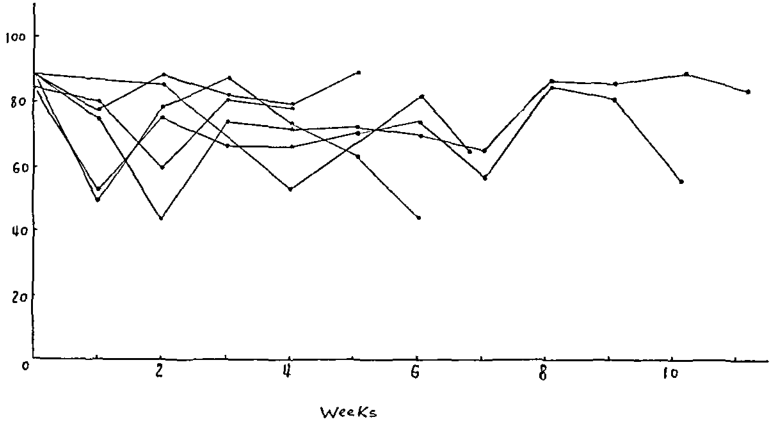

CHART 2.—Ester cholesterol—total cholesterol ratio in totally pancreatoduodenectomized dogs to which methionine and pancreatin were not administered.

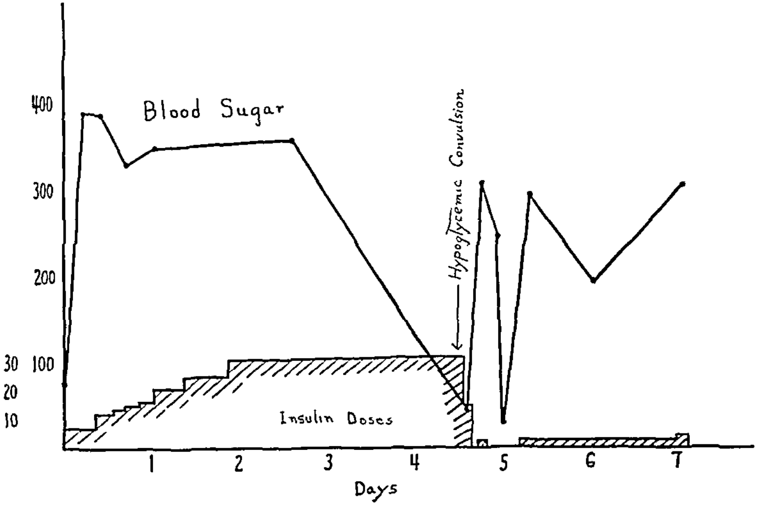

CHART 3.—Levels of blood sugar and insulin dosage. This case is a typical example, showing marked insulin sensitivity. The height of the shaded area indicates the dosage of insulin given and that of the unshaded area the level of blood sugar.

neoplasm, for which a combined total pancreatoduodenectomy is imperative.

I have, therefore, investigated the fall-off phenomena after removing both the pancreas and the duodenum in animal experiments.

TABLE 1.—*Composition of Daily Test Diet*

Rice	100 Gm.	Fat	7.91 Gm.
Barley	100 Gm.	Carbohydrate	151.38 Gm.
Dried Fish	15 Gm.	Total Calories	808
Butter	5 Gm.		
Protein	28.11 Gm.		

TABLE 2.—*Absorption Rates*

Case No.	*Carbohydrate* *Before Operation*	*After Operation*	*Protein* *Before Operation*	*After Operation*	*Fat* *Before Operation*	*After Operation*	*Administration of Methionine and Pancreatin*	*Comment*
2	....	....	79.62	16.02	81.67	4.15	(+)	*This patient was tested in a relatively good condition.
5	....	76.41	79.84	28.33	84.26	(—)	(+)	
8	97.29	77.66	81.19	23.57	87.26	36.67	(+)	
18*	98.61	81.08	78.49	24.29	79.39	45.96	(+)	
18	98.61	70.12	78.49	6.28	79.39	(—)	(+)	**These tests were carried out in the period of marked emaciation, 6 weeks after the operation.
47	98.46	86.32	75.86	34.45	78.76	39.81	(+)	
47**	98.46	78.72	75.86	12.56	78.76	12.21	(+)	
41	99.05	....	79.01	9.09	90.99	22.68	(—)	
47**	98.46	....	75.86	(—)	78.76	(—)	(—)	

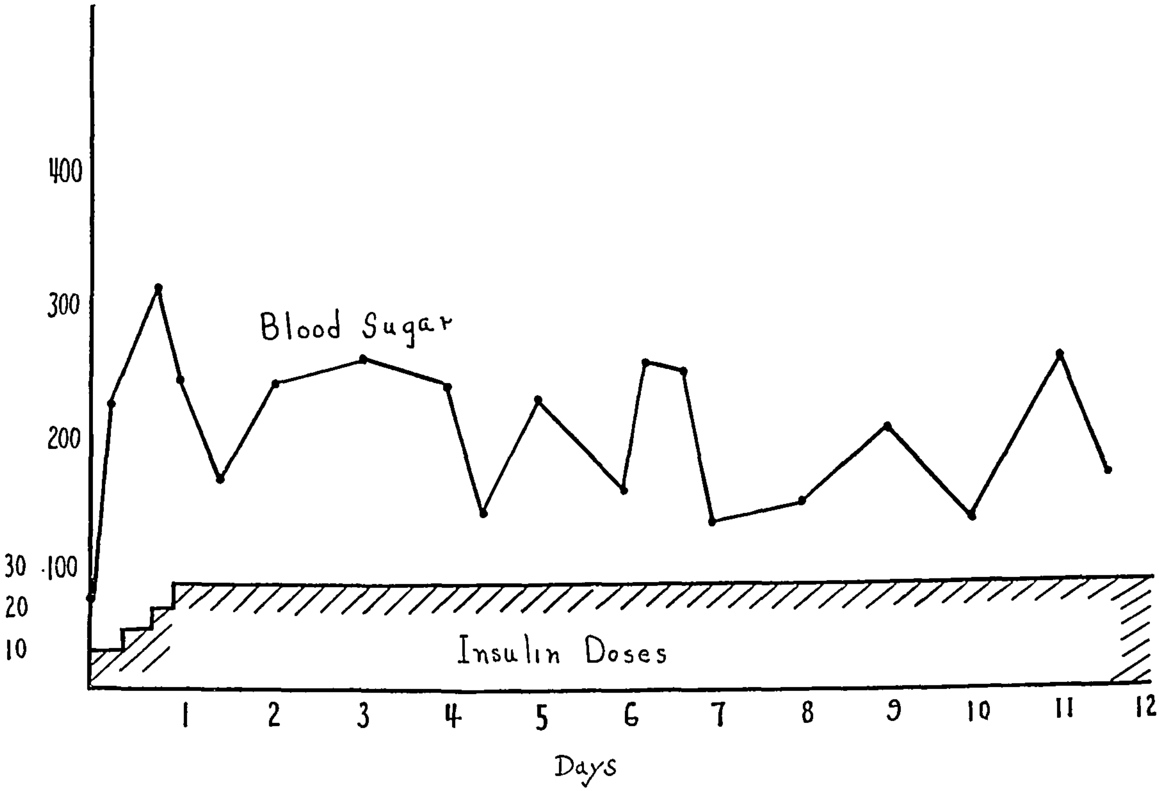

CHART 4.—Levels of blood sugar and insulin dosage. In this case there was no sign of insulin sensitivity throughout the postoperative course.

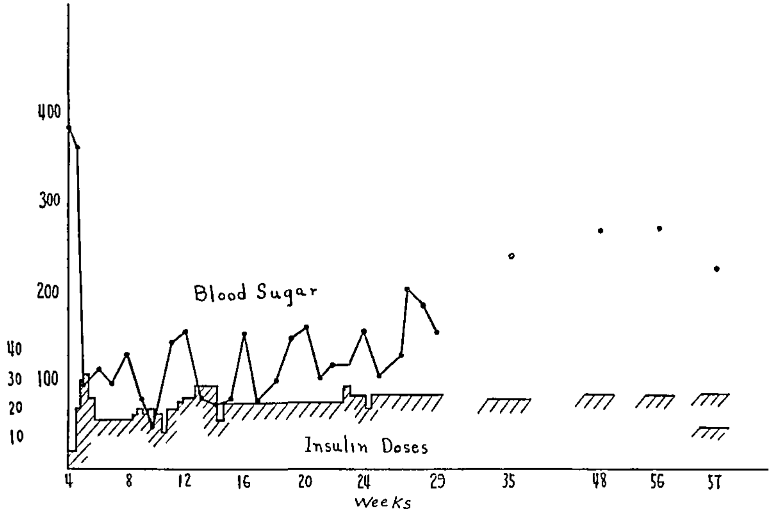

CHART 5.—Levels of blood sugar and insulin dosage (Case 1). Blood sugar level was not determined before the fourth postoperative week.

TABLE 3.—*Postoperative Absorption Rates in Man*

	Time of Investigation	*Constituents of Test Diet* *Protein*	*Fat*	*Carbohydrate*	*Absorption Rate of* *Protein*	*Fat*	*Carbohydrate*	*Administration of Pancreatin and Methionine*
Case 1	2 months after the operation	85 Gm.	40 Gm.	250 Gm.	66%	49%	98%	(—)
Case 1	5 months after the operation	85 Gm.	40 Gm.	450 Gm.	79%	75%	100%	(+)
Case 1	6 months after the operation	85 Gm.	40 Gm.	450 Gm.	76%	69%	100%	(—)
Case 1	12 months after the operation	87 Gm.	31 Gm.	435 Gm.	39%	23%	98%	(—)
Case 1	12 months after the operation	88 Gm.	64 Gm.	410 Gm.	59%	57%	100%	(—)
Case 2	4 months after the operation	46 Gm.	20 Gm.	148 Gm.	56%	71%	99%	(—)
Normal person (control)		85 Gm.	40 Gm.	450 Gm.	84%	97%	100%	(—)

1. *The Development of the Fatty Liver After Total Pancreatoduodenectomy.*—With the object of observing liver functions in depancreatized dogs, I have determined the ester cholesterol-total cholesterol ratio in the serum once a week during the whole survival period. The current literature indicates that in pancreatectomized dogs in which fatty liver developed, there occurred a remarkable

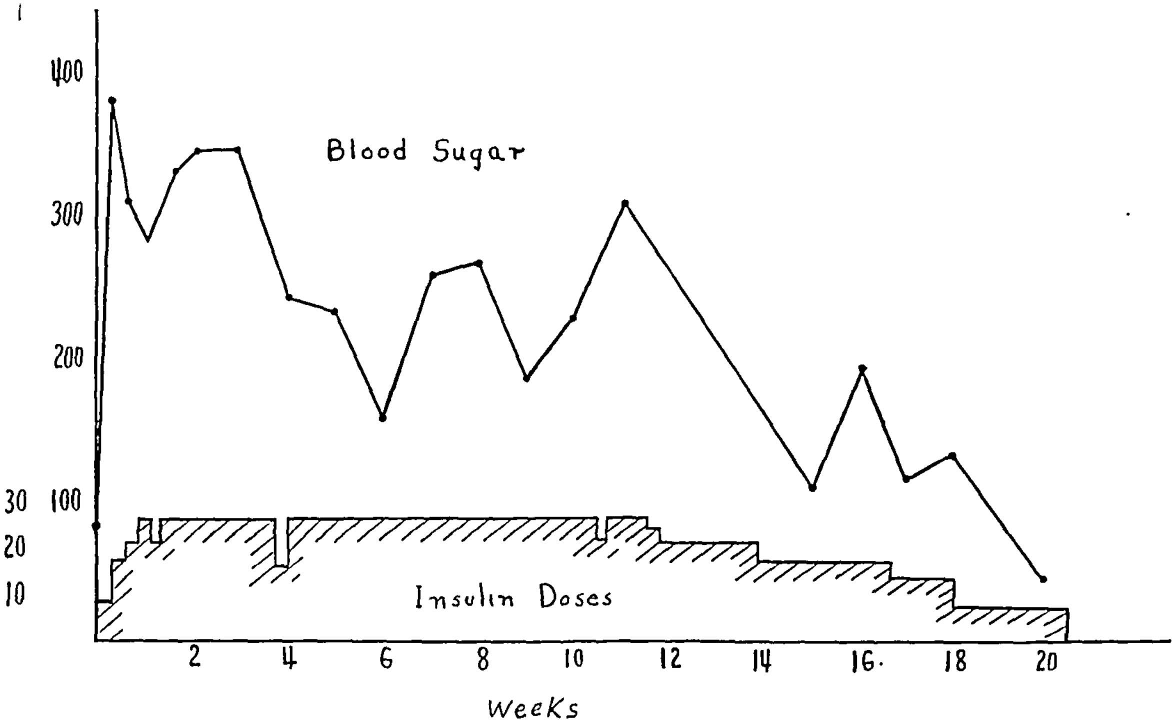

CHART 6.—Levels of blood sugar and insulin dosage in Case 4.

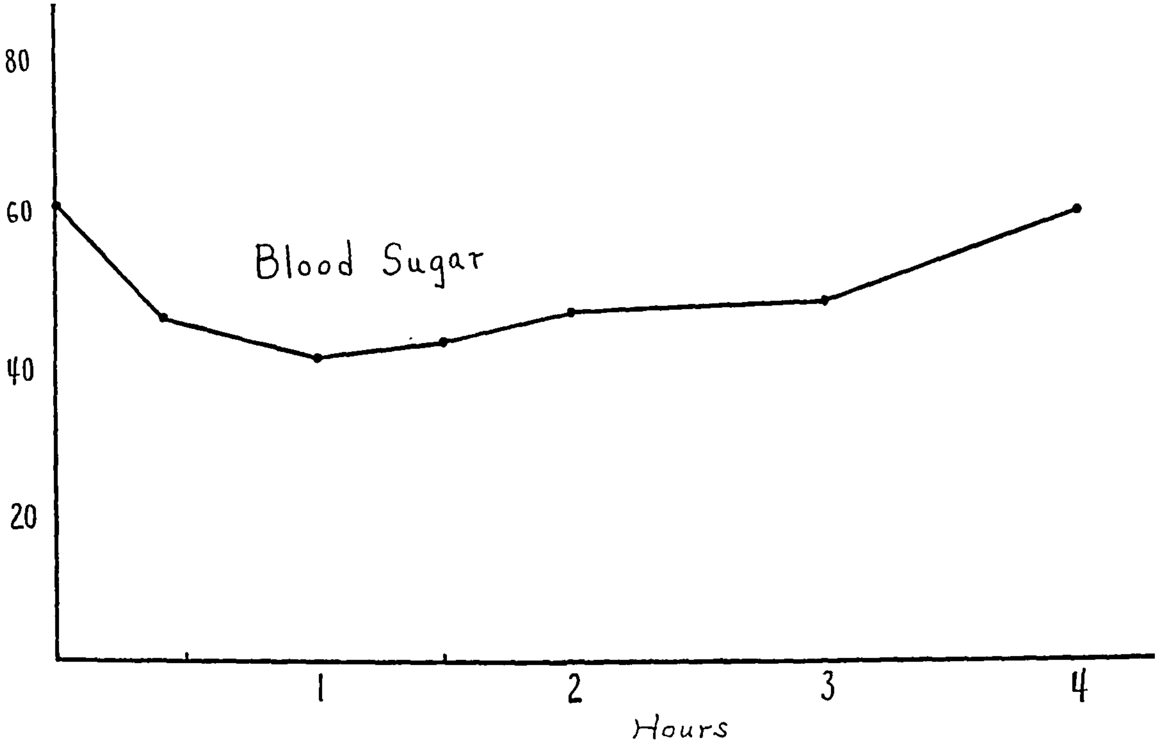

CHART 7.—Results of the insulin tests of normal persons.

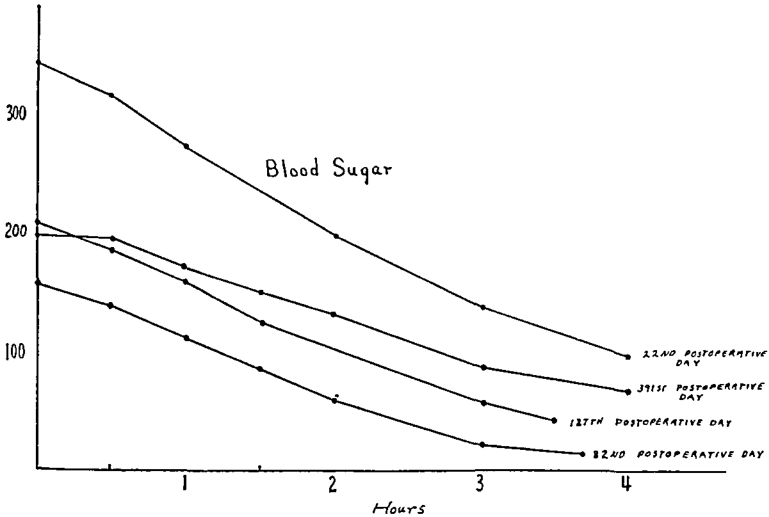

CHART 8.—Results of insulin test of a totally pancreatoduodenectomized person at various intervals after the operation.

reduction in the ester cholesterol ratio.[2]

Under administration of 5 Gm. of pancreatin and 2 Gm. of methionine per day, 5 animals survived for more than six weeks. The ester cholesterol ratio was maintained within the normal range in all animals except 1 (No. 8), throughout the postoperative course (Chart 1).

Coincidentally with these data, I could find hardly any trace of the fatty liver in any of the animals at autopsy, either microscopically, histochemically or by actual measurement of fat in the liver.[3]

In the dogs to which methionine and pancreatin were not administered the ester cholesterol ratio fluctuated widely (Chart 2) and the fatty liver was observed in 1 case at autopsy.

TABLE 4.—*Absorption Rates in Man and in Experimental Animals*

	Absorption Rate of *Protein*	 *Fat*	 *Carbohydrate*
Persons operated on	77%	85%	98%
Dogs operated on......	.21%	16%	98%

These results informed me that the development of the fatty liver could be prevented effectually by the use of methionine and pancreatin. Even when I did not administer these drugs, the fatty liver did not ensue in such a high percentage as reported in the literature.[4]

One of the reasons for these discrepancies in the results may lie in the mode of feeding,[5] because the animals were fed boiled rice and barley together with dried fish instead of raw lean beef or horse meat.

An attempt was then make to determine the efficiency of the gastrointestinal tract after total pancreatoduodenectomy.

To evaluate this efficiency, I adopted the digestion absorption test, determining the amounts of organic constituents (protein, fat and carbohydrate) in the feces as compared with those in the intaken food, and calculated the approximate percentages of food utilization (absorption rates). Table 1 shows the approximate composition of the test diet per day in this experiment.

After the operation the digestion was found to be so heavily impaired in these dogs that the feces resembled vomitus and greatly increased in volume.

In spite of the administration of pancreatin together with methionine, the absorption rates revealed a marked fall, as is indicated in Table 2. Especially did the absorption rate of fat fluctuate widely; it became negative in the worst cases.[6] The average absorption rates for protein and carbohydrate were 21 and 78 per cent, respectively.

As regards fat, the total amount of fat intake was recorded, together with the amount of fat in the feces, in all animals investigated. The average absorption rate was calculated and was approximately 16 per cent.

In experiments in which pancreatin and methionine were not given, further decreased rates were obtained (Table 2).

In man, I have experienced 4 cases of total pancreatectomy in which the patient survived more than five months, and in 2 of them the absorption rate was investigated after the operation (Table 3). The average rates were markedly better than those recorded for animals (Table 4).

From this fact it is reasonable to presume that man retains a much better ca-

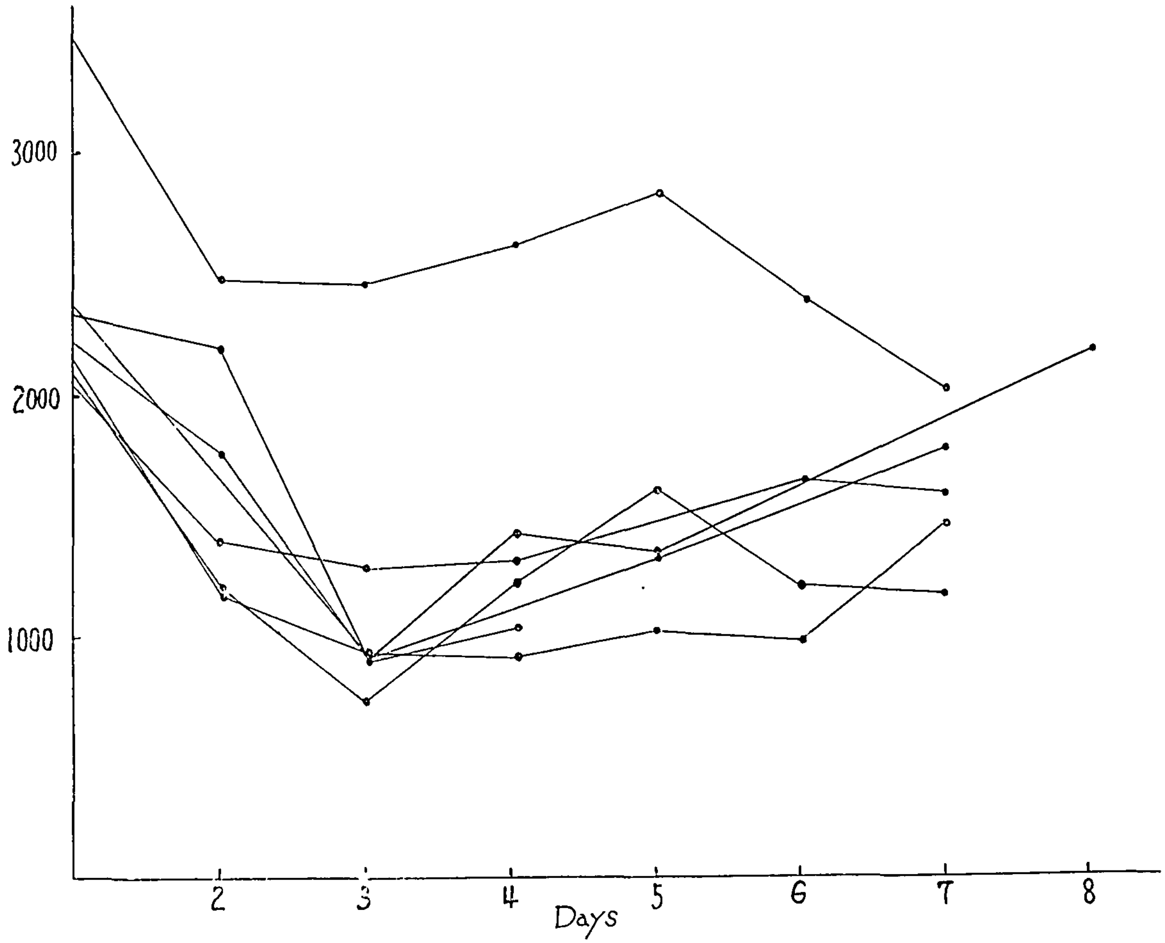

CHART 9.—Levels of serum diastase in totally pancreatoduodenectomized dogs during one week after the operation.

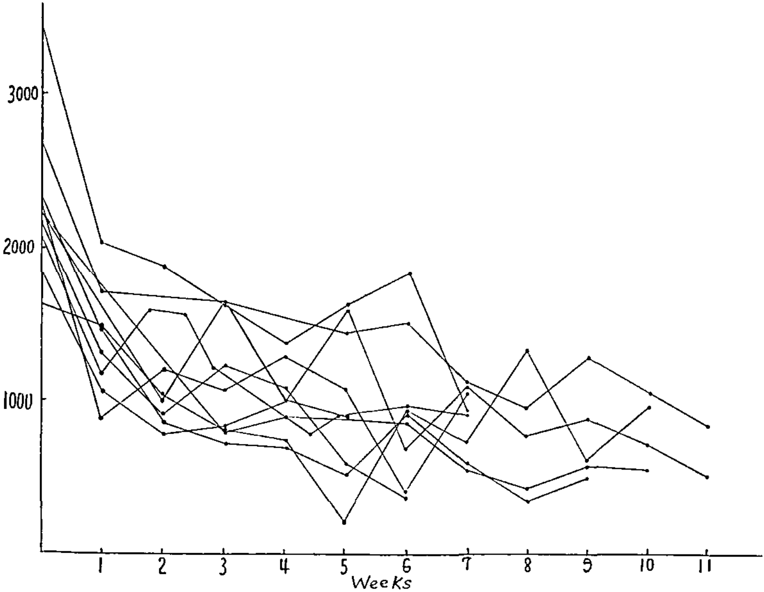

CHART 10.—Levels of serum diastase in totally pancreatoduodenectomized dogs throughout the postoperative course.

pacity for absorption after pancreatoduodenectomy than does the dog.

A woman aged 40 underwent total pancreatoduodenectomy for carcinoma sixteen months prior to the time of writing and is still living and in satisfactory condition without medicament. The serum ester ratio has been within the normal range throughout the postoperative course; consequently, there seems to be no possibility that fatty liver will develop in the future.[7]

Another patient, a man aged 59, had been suffering from prolonged jaundice and showed a marked disturbance of liver function at the time of admission. After pancreatoduodenectomy for carcinoma of the pancreas, the serum ester cholesterol ratio returned to 87.6 per cent (normal value) from 58.8 per cent in the preoperative period. At the time of writing, four months after the operation, the general condition of the patient has improved greatly, and there is probably no danger that fatty liver will develop.

A third patient, a man aged 49, died of recurrent cancer five months after pancreatoduodenectomy, but autopsy revealed no change suggesting fatty liver.

The last patient, a woman aged 46, died of gradually increasing anorexia and emaciation five months after pancreatoduodenectomy for chronic pancreatitis, in spite of the administration of methionine, vitamin B^{12} and folic acid. At autopsy there was the typical fatty liver. In this case, however, the patient had been affected by progressive generalized tubercu-

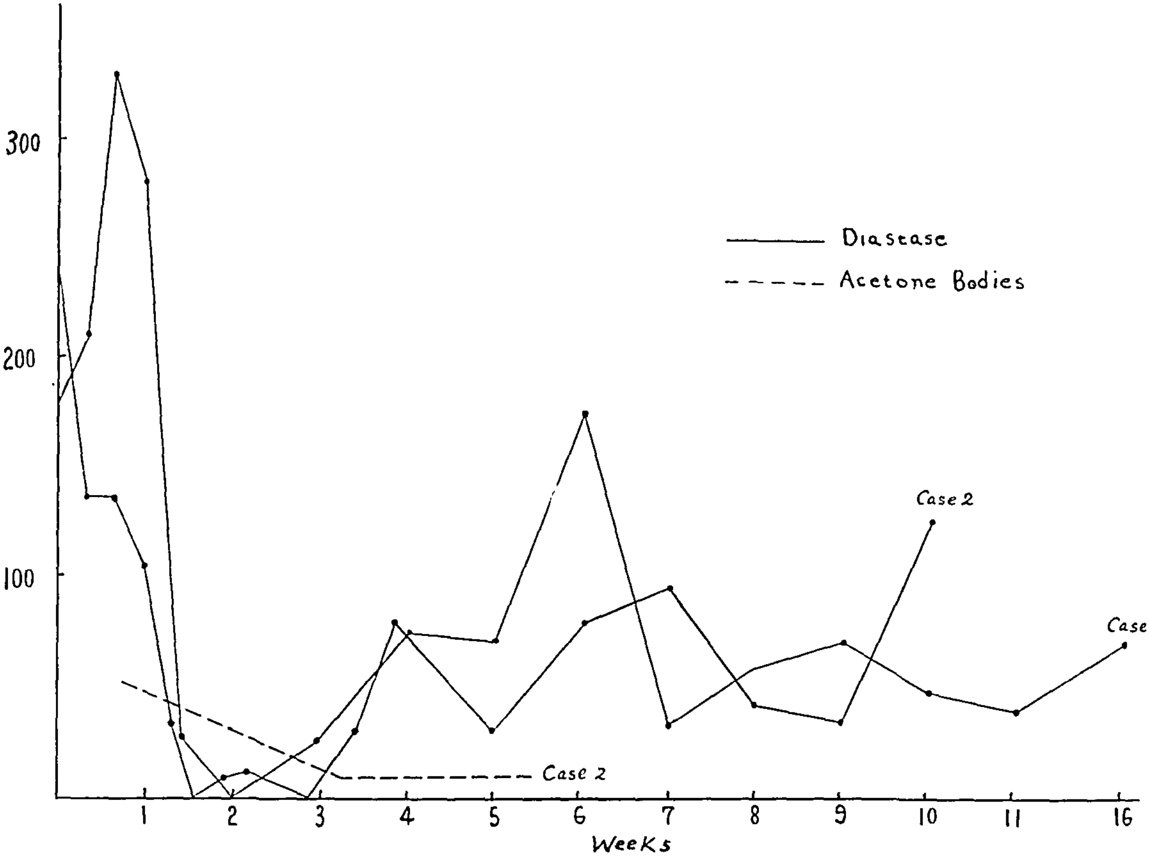

CHART 11.—Levels of serum diastase in totally pancreatoduodenectomized persons (total amount of acetone bodies in the blood is also given).

losis, with the formation of caverns in the left lung. It is a well known fact that the fatty liver is apt to develop in certain cases of tuberculosis.[8] One cannot, therefore, ascribe the occurrence of the postoperative fatty liver solely to the removal of the pancreas.

Thus, in pancreatoduodenectomized dogs the fatty liver may be the result of postoperative dietary failure, which is usually not so heavy in men as to cause a fatty liver.

It would appear, therefore, that total pancreatoduodenectomy does not result in the development of the fatty liver in man unless severe complications take place; in other words, the fatty liver develops postoperatively only in exceptional cases.

II. *Insulin Sensitivity After Total Pancreatoduodenectomy.*—It was pointed out by Dragstedt[4] that in depancreatized dogs the dose of insulin should be reduced gradually after the operation. He stated also that this sensitivity to insulin is a characteristic sign of the fatty liver. It is, however, a problem much disputed whether a marked increase of sensitivity to insulin would also take place in man.

Although in my experiments I recognized such insulin sensitivity in 6 of 15 depancreatized dogs, as illustrated typically in Charts 3 and 4, the development of the fatty liver was observed in only 1. It seems, therefore incorrect to explain the acquisition of this sensitivity merely on the basis of the fatty liver.

In my clinical experience there has been no need of reducing the insulin dose if the patient had a good appetite and was not affected by any severe complication. As is illustrated in Chart 5, a patient who was operated on sixteen months before this article was written is still enjoying good health and has been constantly receiving 26 units of insulin per day, with no sign of hypoglycemia.

Another patient, however, who had suffered from concurrent tuberculosis, became sensitive to insulin after the operation (Chart 6) in spite of the administration of lipotropic substances. Moreover, in the third case in which recurrence of cancer took place and appetite was poor, reduction in the amount of insulin became inevitable in proportion to the amount of food intake.

These observations indicate that in man the amount of insulin given need not be reduced after total pancreatoduodenectomy if an adequate food intake is maintained.

The insulin sensitivity may be accounted for, not by the development of a fatty liver, as was stated by Dragstedt, but probably by the disturbance of digestion and absorption of food after the operation; with the lapse of time there develops a sort of inanition, more severe in dogs than in men. I have injected into human patients in a state of fasting a small subcutaneous dose (10 units) of regular insulin and measured the blood sugar level at certain intervals for four hours after the injection. The blood sugar curve thus obtained in normal persons is shown in Chart 7.

In the case of pancreatoduodenectomized persons this test revealed a marked sensitivity to insulin (Chart 8), even in those cases in which reduction of the insulin dose was clinically unnecessary for a fairly long period after the operation. The persons operated on are, therefore, considered to be in a state of latent insulin sensitivity, which manifests itself if they are compelled to fast.

Considering the fact that the form of the blood sugar curve in the insulin test did not alter at all in my cases for a considerable time after the operation, it seems improbable that some humoral mechanism may come into play from other endocrine glands in order to compensate the postoperative deficiency of sugar metabolism.

It is noteworthy that in my case the sugar tolerance curve remained essentially the same, both in the early postoperative stage and one year later.

III. *Changes in the Value for Serum Diastase After Total Pancreatoduodenectomy.*—The source of the diastase that appears in normal blood is as yet unknown. It is said that under normal conditions neither the pancreas nor the salivary glands have any influence on the diastase content of the blood, and that the transient drop following pancreatectomy is not necessarily due to the absence of the gland, since a less severe operative intervention on any other organ exerts a similar effect on the blood diastase.

Somogyi[9] stated that ketosis in human beings invariably entails a substantial lowering of the blood diastase level, and a similar effect is the most plausible cause of the transient drop in depancreatized dogs.

In my experiments with animals, I also observed lowering of the serum diastase level after total pancreatoduodenectomy but not its complete loss (Charts 9 and 10) at any time while the animals survived.

But, in 2 cases of totally pancreatoduodenectomized persons, however, I noted that the serum diastase level fell to 0 (Chart 11) transiently, soon returning to the normal level, and has been fluctuating within the normal range up to the time of writing, more than a year after the operation.

Furthermore, in determining the amount of acetone bodies in the blood, I have come to the belief that there exists no correlation between the drop in the diastase level and the aggravation of ketosis, either in pancreatoduodenectomized dogs or in man.

Thus it is reasonable to suppose that the pancreas plays an important role in human beings as the source of the blood diastase even in the physiologic states.

SUMMARY AND CONCLUSIONS

The development of the fatty liver after total pancreatoduodenectomy, which has been observed in dogs and is supposed to be the greatest obstacle in carrying out this operation, does not seem to be an unavoidable sequela in man.

In addition, the author has obtained some results contributing to the knowledge about susceptibility to insulin after total pancreatoduodenectomy and about the physiologic significance of serum diastase. By these results the author is firmly convinced that, if the indications are properly discerned, this kind of operation may be performed on man without much postoperative danger.

SUMÁRIO E CONCLUSÒES

Pensam os autôres que a degeneração gordurosa do figado desenvolvida nos cães operados de pancreatoduodenectomia total-e que se apresenta como obstaculo intransponivel a ultilização dessa intervençao no homen,—não parece uma sequencia eminentemente obrigatoria no sêr humano.

Mediante experimentações procedidas com o emprego da insulina após a pancreatoduodenectomia total, e pela pela significação fisiologica das diastases sericas, os autôres se convemceram de que, se as indicacãos, forem bem estudadas, êsse tipo de intervenção poderá sêr procedido no homem sem um risco posoperatório muito pronunciado.

RESUMEN Y CONCLUSIONES

La degeneración grasosa del hígado observada en el perro después de la pancreatoduodenectomía total que se ha considerado como el mayor obstáculo para este procedimiento quirúrgico, no parece ser una secuela inevitable en el hombre.

Además, el autor ha obtenido algunos resultados que contribuyen al conocimiento acerca de la susceptibilidad a la insulina después de la pancreatoduodenectomía y acerca de la significación fisiológica de la diastasa sérica. - Por estos resultados, el autor esta firmemente convencido que esta clase de operación puede ser realizada en el hombre sin mucho riesgo post operatorio si las indicaciones son conocidas adecuadamente.

RÉSUMÈ

La dégènérescence graisseuse du foie, rencontrée chez le chien pancréato-duodénomectomisé, ne semble pas se rencontrer chez l'homme. De plus, les auteurs semblent avoir augmenté leurs connaissances sur l'usage de l'insuline et la diastase du sérum dans de tels cas, avec de bonnes indications opératoires. Cette opération peut se faire sans danger chez l'homme.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

Die Entwicklung einer Fettleber im Anschluss an Resektion des Pankreas und Duodenums, wie sie am Hund beobachtet wird, und die das grösste Hindernis zur Durchführung dieser Operation darstellt, scheint beim Menschen nicht eine unvermeidliche Folgeerscheinung zu sein.

Ferner hat der Verfassere einige Beobachtungen gemacht, die zur Erweiterung unseres Wissens über die Insulinvertraglichkeit nach totaler Resektion des Pankreas und des Duodenums und über die physiologische Bedeutung der Serumdiastase beitragen. Der Verfasser kommt auf Grund seiner Ergenbnisse zu der Ueberzeugung, dass diese Form der Operation am Menschen, wenn eine sorgfältige Indikations-stellung germacht worden ist, ohne grosses postoperatives Risiko ausgeführt werden kann.

RIASSUNTO E CONCLUSIONI

La degenerazione grassa del fegato dopo duodeno-pancreatectomia totale, quale si osserva nei cani e si suppone sia il maggior ostacolo a tale intervento, non sembra una conseguenza inevitabile nell'uomo.

Inoltre alcuni risultati dell'autore contribuiscono alla cono-scenza della sensibilità all'insulina dopo duodeno-pancreatec-

tomia totale e del significato fisiologico della diastasi serica. In base a questi risultati l'autore è seriamente convinto che, se le indicazioni sono poste esattamente, tale tipo di operazione è fattibile nell'uomo senza che ne derivi eccessivo pericolo postoperatorio.

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Internal Derangements of the Temporomandibular Joint

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THE only movable bone in the face is the mandible. Its articulation with the temporal bone, although commonly described as a hinge joint, has in fact a much more complex function. The human joint has evolved through the ages so that it combines several functions.

In the humble herbivore the all-important action is grinding, subserved by a set of muscles known as ptyergoids, which can actuate lateral movements of the mandible. Such animals have no need for wide opening of the mouth in order to engulf the herbage. The hippopotamus may be the exception, but he is specially modified for his aquatic environment.

In the reptilia the mandibular joint has developed great laxity because the snake, having no teeth worthy of the name, must swallow his bulky prey whole. The boa, by dislocating its lower jaw, can swallow whole an animal of considerable size. Here the wide opening is all-important, and a grinding function does not exist.

In the human being, both of these functions are to some extent preserved, but as in all cases when a compromise is effected, perfection is not achieved in either department.

In order to obtain the movements required for grinding, chewing and speech, a simple hinge with its axis through the joint fulfils all requirements (Fig. 1*A*). But when a wider opening is imperative, as in biting an apple or in yawning, then the condyle must slide forward onto the eminentia articularis, and the axis of the movement must be lower, i. e., through the openings of the inferior dental canals; and the mandible is slung from this point by the three ligaments known as stylomandibular, sphenomandibular and pterygomandibular.

A special type of joint is obviously required for two such diverse functions, and the problem has been solved by dividing the joint space into two separate compartments by means of a disc of fibrous tissue, which is attached to the capsule throughout its whole circumference (Fig. 1*B*). The true hinge movements occur in the lower joint, between the condyle and the dome-shaped meniscus, while the gliding movements around the wider arc are effected by the condyle and disc together moving backward and forward in the upper compartment.

Examples of the power of the masticatory muscles may be given: A lion has been observed to leap over a fence 10 feet high, carrying his prey, a 400-pound young ox, in his mouth. Even in man these muscles are incredibly strong. At the Moulin Rouge in Paris I have seen an acrobat hang by his feet, holding another man in his teeth by a strap. At a performance in Leicester, V. K., an acrobat climbed up a 10-foot pole which was held balanced by the incisor teeth of another man. I have known a man who carried a sheep across a field in his teeth without the slightest difficulty, holding it by the wool on its back.

Backward Movement. — The maximum backward travel occurs when the teeth are clenched and the posterior horizontal fibers of the temporalis muscle pull the condyle backward. If the bite is now relaxed, the mandible will adopt the position of rest. Between these two positions of full occlusion and rest is a small arc of movement known to dental surgeons as the "freeway space." The extent of this

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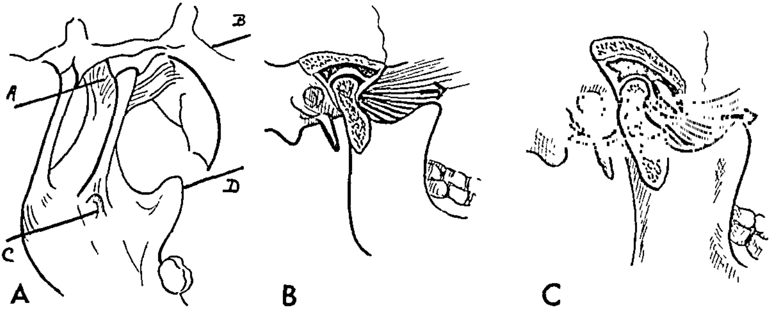

Fig. 1.—*A*, temporomandibular joint; its axes and ligaments. Line *AB*, axis for incisor bite; line *CD*, axis for molar bite. *B*, temporomandibular joint sectioned to show compartments, interarticular disc and external pterygoid muscle. *C*, dislocation of the disc, which is drawn forward by the external pterygoid muscle.

free space varies in individual persons, and it has been claimed (Ireland, 1951) that a clicking jaw is prone to occur in persons who have an extensive "freeway space." In support of this, it is claimed that a dental bite-splint to reduce the freeway space will relieve many cases of clicking.

Forward Movement.—When the jaw is widely opened, the disc and condyle together move forward onto the eminentia articularis of the zygoma. The upper fibers of the external pterygoid muscle which are attached to the anterior joint capsule now pull the disc well forward out of the way (Fig. 1*C*). Some claim that during yawning a sudden spasm of these fibers, which should relax during the closing of the jaw, may actually avulse the disc from its flimsy posterior attachment to the capsule (Fig. 2*A*). When this disaster occurs—from whatever cause—the liberated disc moves forward and constitutes an obstruction to opening the mouth. Once torn loose, it is thereafter always liable to nipping, with recurring episodes of pain, clicking and locking.

When a hard object is bitten on with the molar teeth the three mandibular ligaments are in tension. The powerful masseters and temporals thus expend their force on the molar region, and the condyles of the mandible are not actually subjected to the compression. This remarkable arrangement explains why a mandibular condyle can be removed by the surgeon for various reasons, without destroying the power of the bite.

When an object is bitten with the incisor teeth, however, the condyles are to some extent compressed; but the action at the incisors is not powerful, being a nibble rather than a bite.

The Articular Disc (Fig. 1*B*) : Wakeley (1948), after examining over 100 specimens in the anatomy and postmortem departments of King's College Hospital, pointed out that the articular disc is still erroneously described in current anatomy textbooks as thin in the center and thickest posteriorly, whereas in fact it is thickest in the center and anteriorly, and is very thin posteriorly where it passes down over the back of the condyle to fuse with the capsule behind the joint (Fig. 1*B*). Once it has lost this weak posterior attachment the disc is pulled forward by the external pterygoid muscle fibers and will be found at operation in the anterior medial part of the joint (Fig. 2*A*).

The Interarticular Meniscus: This structure, whose primary function is to fill up

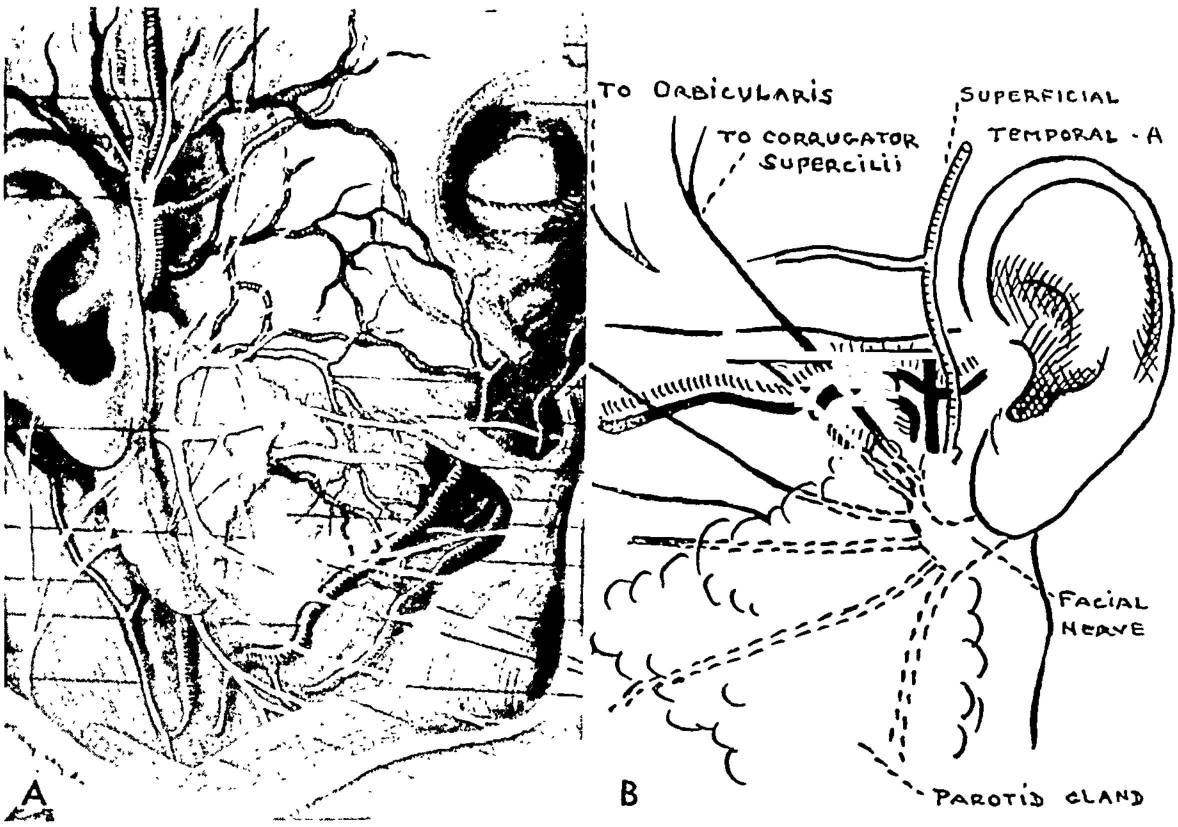

Fig. 2.—*A*, skin incision used to expose the joint. *B*, sketch from Callender's Surgical Anatomy, showing structures in vicinity of temporomandibular joint.

the irregular space in the joint and give it a smooth gliding action, is often erroneously described as a cartilage. The disc in fact consists entirely of fibrous tissue and contains no cartilage. Cartilage, of course, is an avascular tissue, and therefore a knee cartilage once torn never unites. Fibrous tissue, on the other hand, is not completely avascular, and therefore it is held by certain of the more optimistic that a "jaw-cartilage" (so-called), may reunite after it has been torn away; and this is theoretically possible, although it probably never occurs in practice.

Lateral Movement. — Man, with his mixed diet, retains some of the grinding movement, which is actuated by the pterygoid system of muscles. Such movements can readily be felt by the finger placed over the joint during eating. Ireland (1951) expressed the opinion that when one articular disc has been damaged these lateral movements are so affected that the contralateral disc is certain to be injured in due course, and this is a factor that helps to explain the frequency with which a disc lesion is bilateral in the temporomandibular joint. It is probable that the more important predisposing factor, however, is the congenital laxity of capsule which occurs in certain persons. In cases of clicking jaw some dental surgeons not only endeavor to control the "free space" with bite splints but use a process of selective grinding of teeth where abnormal inclined lateral planes on the cusps are considered to threaten the integrity of the contralateral disc (Beyron 1945). From the surgeon's point of view, the efficiency of these dental measures appears very doubtful.

Anatomic Relationships of the Temporo-

mandibular Joint.—A point of surgical importance is the proximity of important structures to the joint (Fig. 2*B*). Immediately behind it are the superficial temporal artery and the auriculotemporal nerve. The latter supplies the joint, the pinna and the adjacent scalp above the pinna. Pain caused by locking of the joint may be referred to this distribution in the acute phase.

In front of the joint are branches of the facial nerve passing to the corrugator supercilii, orbicularis and other facial muscles. Below are the parotid gland, the facial nerve and Stensen's duct.

It must be obvious that there is very little safe space between these structures through which to approach the joint. Add to this the fact that the face is very vascular, and it will be realised that the operation of exploring the joint is not a simple one.

This vascularity can be reduced considerably by preoperative infiltration of a solution of 1 per cent procaine hydrochloride and 1 1:200,000 epinephrine after the methods recommended by Corlette (1948). An almost bloodless field is obtained by the use of hypotensive drugs (hexamethonium bromide) is employed by Enderby (1950, 1951, 1952). This method is in use at the Royal Victoria Hospital, London, and at the Royal National Orthopaedic Hospital, also in London.

The safety of the surrounding structures is enhanced by using a light spring goiter retractor to keep them out of harm's way.

Incisions.—As these are dependent on anatomic considerations, they will best be considered at this stage. The incisions used are based on the transverse line of the zygoma above the joint. Wakeley (1939) expressed preference for the T-shaped incision (Fig. 3); Campbell (1949) favored conversion of the horizontal incision into an inverted L by carrying the vertical limb down a fingerbreadth in front of the tragus (Fig. 2*B*). This involves turning a skin flap forward and is the method I use, as giving an excellent cosmetic result. A third method is to turn a flap upward with its base along the zygoma (Pickerill, Wakeley and others). The danger point is the lower end of the incision, where it approaches the facial nerve. There should be no attempt to clamp vessels here.

Comparison of Internal Derangements of the Temporomandibular Joint with Those of the Knee Joint.—Romanis and Mitchener (1949) have drawn a parallel between lesions in these two joints. From the foregoing remarks, however, certain points of difference will already be apparent. The temporomandibular meniscus is attached all round its periphery, while the knee cartilage has a free medial crescentic border. In structure the menisci also differ, one being fibrous and the other cartilaginous. The damaged medial knee cartilage is often split, either lengthwise or across, while the mandibular disc is separated *in toto* from its posterior attachment and drawn forward. There is a similarity, however, in that a lesion in either joint is characterized by clicking and by episodes of locking, with pain and synovitis. When the knee locks it cannot be straightened; but when the temporo-

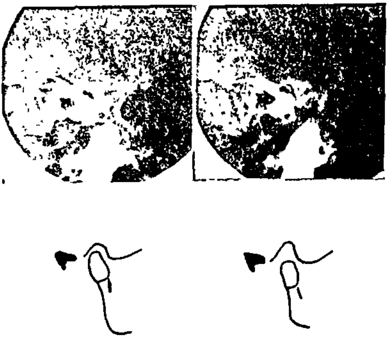

Fig. 3 (Case 2).—Roentgen appearances on right side. *Left*, view with mouth closed. Condyle occupies the joint space. *Right*, view with mouth open. Condyle fails to ascend the eminentia. A displaced meniscus was present on this side.

ures fail, surgical treatment may be considered—e.g., meniscectomy, capsular lacing with fascia lata or silk, small bone graft on the eminentia articularis, or injection of sclerosing fluid into the lower segment of the joint. The last-mentioned procedure is not free from the danger of permanent synovitis or arthritis, and is not generally recommended (Schultze, 1937).

3. Cases in which locking has occurred and has failed to recover spontaneously or after manipulation, or has recurred. Local periarticular infiltration of 2 cc. of 2 per cent procaine hydrochloride should be employed in all cases of locking. This may relieve the condition in an early stage. When it fails, meniscectomy is the treatment of choice. It is probable that all forms of surgical intervention profit by the consequent scarring and tightening of the capsule.
4. Cases of advanced osteoarthritis requiring condylectomy.
5. Cases of bony ankylosis resulting from acute suppurative arthritis, requiring treatment by arthroplasty (Figs. 10 and 11).

As has been mentioned, clicking and locking are often bilateral and usually occur in middle-aged women.

Some writers have recorded a considerable series of cases in which the meniscus has been removed. Thus Karl Boman in Sweden (1947) recorded the results of disc removal in over 100 cases, not all the loose discs being actually displaced. He concluded that the clicking in all these cases was due to overriding of the edge of the meniscus by the condyle. After extirpation of the disc, the crepitation and clicking ceased in all his cases.

Of 32 patients treated by Wakeley (1948) for recurrent dsplacement of the articular disc, operation for its removal was carried out in 12.

After removal of the disc an immediate and dramatic cure is not usually evident, because a period of six to eight weeks is required for the operative trauma and spasm to subside, and the patient should be forewarned of this fact for her own peace of mind.

It may be appropriate here to detail the *symptoms of a displacement of the disc*:

1. A sudden acute pain in the joint, perhaps referred by the auriculotemporal nerve to the pinna and the scalp above this.
2. Limitation of opening (sometimes closing) of the mouth, with a feeling of an obstruction in the joint.
3. Excessive salivation. This may occur in the earlier episodes; it is less frequent in the later recurrences.
4. Difficulty in mastication, since movements cause pain.
5. Recurring episodes of locking, with further stretching of the capsule and snapping whenever the mouth is widely opened.

If a roentgenogram is taken while the patient attempts to open the mouth, the condyle may be found in some cases to have moved downward instead of forward, and the joint space to have become widened (Wakeley, 1939). This sign should be accepted with some reservation, because the patient with trismus cannot, in any case, fully cooperate by opening his mouth to a sufficient extent.

Operative Details.—The skin and superficial fascia are divided by means of one of the incisions already described (Fig. 4*A*). After careful hemostasis and retraction, the zygoma, the masseteric fascia and the joint capsule are exposed. It is convenient to divide the capsule along its periosteal attachment to the zygoma, and in addition vertically over the joint (Fig. 4*B*), using the spring goiter retractor to hold these flaps open. A gauze pack soaked in 1:1,000 epinephrine is now introduced into the cavity for a few minutes to check capillary oozing from the joint. With a small instrument the condyle may be levered downward, opening up the joint space so that the elusive disc may be located in the forward compartment, seized with small toothed artery forceps and dissected free from the capsule with a tenotome. This may not be an easy matter, and the operating surgeon must be sure that he has got the actual disc, which is unmistakable once it has been secured.

Repairs are effected in the reverse order, and the skin is sutured with everting interrupted stitches of very fine material, such as silk, nylon or horsehair, which are removed on the third or fourth day. No external dressings are required.

The effect of the operation is to remove the obstructing cartilage and incidentally tighten the loose capsule by scarring.

At first the result may appear disappointing to the patient, who cannot yet open her mouth on account of the pain; but after some weeks she will be comfortable, free of all clicking, pain and locking, and although the ultimate range is usually somewhat restricted, so that a wide bite or yawn may not be possible, yet there is no more grateful patient.

Brief records of 3 cases illustrating most of the foregoing points are now presented here. All of the patients were women. In 1 the condition was bilateral.

REPORT OF CASES

CASE 1.—Miss N. F., aged 20, a stenographer, was admitted to the hospital on March 29, 1949. For three months she had been unable to open her mouth sufficiently to bite an apple, and was quite unable to yawn.

For several years the temporomandibular joint had "clicked out and in" and biting had caused a pain in the joint. Three months prior to admission it "went out" and had failed to go back.

On examination it was observed that the mouth would open to only half its normal range. No clicking could be elicited, and both temporomandibular joints moved smoothly within their reduced range. Roentgenograms April 4 were reported as indicating that the right temporomandibular joint was not abnormal but that there was complete lateral impaction of a right wisdom tooth.

This wisdom tooth was removed forthwith, together with the adjacent second molar, but no improvement resulted. Further roentgenograms dated August 25 were described thus: "Left joint appears normal. Right joint shows slightly restricted movement of the articular process of the mandible when the jaw is open, but no arthritic changes can be detected." These films show that with the mouth open there is a normal condylar excursion on the left side, whereas on the right side the condyle moves downward only and is prevented from riding forward onto the eminence. This suggests a disc dislocation on the right side. On September 20, after six months, the condition was unchanged, and a consultation with a surgical colleague was requested and arranged. His advice was to do nothing about it, and no further action was taken.

Comment.—The case of this patient, a young woman of 20, illustrates a lax temporomandibular joint one one side with clicking and recurring episodes of locking and spasm. It is probable that removal of the meniscus is the best treatment in this case, but so far it has not been carried out.

CASE 2.—Mrs. W. M., aged 40, a housewife, was admitted to the hospital on Nov. 24, 1950. The right lower jaw "cracked and locked," but this had not been painful until a month before admission, at which time the patient had been fitted with new dentures which she considered too high. The dentist insisted that this would be remedied by biting hard on the synthetic molars, in order to force them into good occlusion. When the patient did this the jaw on the right side immediately locked, so that she could not open it enough to yawn or masticate food or insert her denture; and during the ensuing month she lost weight because the acute spasm prevented her from eating. By the end of the month both jaws were "snapping" and there was pain in the left temporomandibular joint also. Lateral movements of the mandible caused snapping.

The patient was thin. She was unable to open her mouth wide enough to accommodate a teaspoon, on account of pain in the right temporomandibular joint. She was completely edentulous.

Roentgenograms dated November 27 were described as follows: "Left: no bone or joint lesion detected. Right: there appears to be some restriction of movement of the mandible." The films showed bilateral failure of the condyle to ascend the eminence when the mouth was opened. This suggested a bilateral disc displacement (Fig. 3).

An anesthetic was administered, and the jaw was manipulated. It could be opened fairly widely. Both temporomandibular joints proved

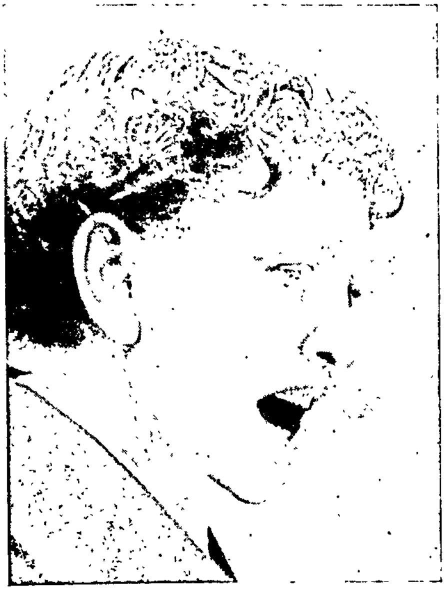

Fig. 5 (Case 2).—Photograph taken on Nov. 1, 1951, twelve months after menisectomy on both sides. Mouth fully opened; operation scar barely visible.

lax and snapping. After this the patient was advised to return home and allow time for pain and spasm to subside. She came back, however, in a few days, being unable to endure the pain longer.

Meniscectomy was performed on the right side on December 3. A displaced disc was removed from the anterior part of the joint by means of an inverted L shaped incision, and the patient, considerably relieved, returned home after a few days. Less than a month later she returned, with similar locking affecting the left side, and on December 28 the left cartilage was also removed, the same technic being used. The patient was warned that six weeks would be required for the symptoms to disappear.

Six weeks after the second operation there was loss of all pain and locking, with a useful range of movement sufficient to allow both mastication and the wearing of both dentures, but insufficient to allow a yawn.

On Jan. 11, 1951, after twelve months, the patient has regained her full weight, was using her dentures and could eat and sleep, but could not yawn or take a wide bite. A further locking now occurred on the left side and required insertion of a small bone graft into the eminentia (Fig. 5).

Addendum.—On Nov. 19, 1951, when the patient opened her mouth to eat a bun, the left side appeared to lock, and became painful. A few days later she yawned and there was a stab of pain, followed by complete trismus.

She reported for treatment in considerable pain over the left temporomandibular joint.

An injection of 2 cc. of 2 per cent procaine hydrochloride was made around the joint. Anesthesia followed, together with a temporary ablation of function of the upper facial nerve fibers. She was able to open the mouth at once, and all spasm disappeared. She returned to her own city. There was no more trouble for six weeks.

On Feb. 3, 1952, when on holiday in the North, she yawned widely. Immediately there was a stab of pain in the left temporomandibular joint, followed by trismus and inability to open the mouth. There was salivation, recurring at each attempt to open the mouth, with tenderness over the parotid gland.

In this distressing condition she consulted an orthopedic surgeon, who was nonplussed and could not offer any effective assistance.

She returned to this city, and entered the hospital. On examination the mouth would not open more than half an inch, and there was painful trismus in the left side. It appeared evident that the left joint was lax, so that a yawn allowed luxation of the condyle over the eminentia, followed by pain and trismus.

Operation was performed on March 17. The left temporomandibular joint was reopened, and a hole 5/64 inch in diameter drilled into the eminentia. A tapered bone peg was cut from the tibia and driven into this hole. The capsule was repaired with linen thread and the wound closed.

Pain and trismus subsided, and the patient returned home with good function restored in the mouth.

The operation was complicated by temporary paresis of the upper facial fibers, which was ascribed to the use of the spring retractors.

The history of this case alone is enough to emphasize the complexity of the problem of the locking temporomandibular joint.

Comment.—This case illustrates a bilateral disc lesion. There was predisposition to injury by a loose capsule; the locking on the right side was thus precipitated by a hard bite on the molar region. The left side followed suit, probably from the same cause, although on this side laxity of the capsule was not proved by roentgenogram.

Case 3.—Miss C. H., a nurse, was admitted to the hospital on March 12, 1951. She was unable to open the mouth more than just sufficient to insert a dessert spoon. She had noticed "clicks or cracks" in the right temporomandibular joint for an indefinite period, but it had never locked until six weeks prior to admission, at which time the locking followed a yawn. Spontaneous reduction had not occurred, although the initial swelling had subsided.

On examination the mouth would not open more than sufficiently to admit an index finger. Movement of the jaw was painful, and this pain was referred to the temporomandibular joint and the ear. In this case the roentgen data were not helpful, as the condyle on opening fell just short of the full ascent of the eminence.

Manipulation of the jaw was done on April 27, with the region under anesthesia, but reduction apparently was not achieved, and operation was done on June 8. The joint was exposed by an inverted L incision and the meniscus removed. It was located, with considerable difficulty, in the anteromedial part of the joint. The use of epinephrine packs proved helpful during this part of the operation, as the recently inflammed joint showed a tendency to capillary oozing.

After the operation the patient noticed that she could not elevate the right eyebrow, owing to paresis of the corrugator supercilii. This was considered due to the retraction of the upward-going branch of the facial nerve to this muscle during the operation, and she was advised that some six or eight weeks might be required for its recovery.

Six weeks later the function of this muscle was fully restored, and the mandible could be opened sufficiently for the ordinary purposes of mastication. *Pain had disappeared, and* there was no further clicking or snapping in the joint.

Seven months after the operation there was freedom from pain, clicking and locking, with a useful range of opening, but the jaw could not be opened widely enough to yawn or take a bite out of an apple. Only about two thirds of the range had returned up to that date (Fig. 6).

Comment.—This case is interesting as displaying one of the possible complications of the operation—paresis of a facial muscle.

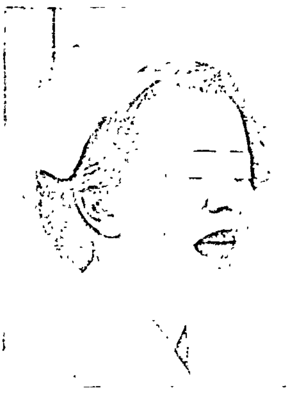

Fig. 6 (Case 3).—Range of opening of the mouth seven months after removal of the meniscus.

SUMMARY AND CONCLUSIONS

1. Clicking, snapping and locking of the temporomandibular joint is not an uncommon entity, is sometimes bilateral, and occurs at any age but usually in middle-aged women.

2. These symptoms tend to occur in the person who has a lax joint capsule, although this is not necessarily always the case.

3. The most usual cause of the trouble is probably an interarticular disc which is either unduly mobile or actually displaced.

4. The condition should be treated on principles which are now well established with regard to similar derangements of the knee joint.

5. The anatomy of the joint and the causation of symptoms are discussed and the recent literature on the subject reviewed.

6. Sufficient detail has been given to assist those interested in this subject with the diagnosis and operative treatment.

7. The postoperative result is a satisfactory one, although the immediate result may not be dramatic, and some limitation

in the degree of opening of the mouth may be permanent.

SUMÁRIO

1. Certas perturbações articulares da temporo-mandibular não são raras, muitas vezes são bilaterais, ocorrendo em qualquer idade, mas usualmente em mulheres de mêia idade.

2. Tais sintômas tendem a acontecer em pessôas que têm a capsula articular relaxada, o que, aliás, não é sempre indispensavel sêr registrado.

3. A causa mais comom de tais disturbios é a presença de um disco intervertebral, que tão pode sêr excessivamente movel, como momentaneamente deslocado.

4. Tais perturbações da mobilidade articular devem sêr tratados obedecendo a principios não muito bem estabelecidos, porém que devem sêr os mesmos adotados para complicações semelhantes que atingem o joelho tambem.

5. A anatomia da antibulação temporo-mandibular e a causa de tais sintômas que afetam a mobilidade articular são revistos, o mesmo sucedendo a mais recente literatura sôbre o assunto.

6. São traçados os pontos principais a sêrem adotados para o diagnostico e tratamento cirúrgico de tais casos.

7. Os resultados posoperatórios são satisfatórios, si bem que os efei tos imediatos possam não sêr brilhantes; é verdade que pode sôbrevir uma diminuição no grau de abertura da bôca, o que pode ocorrer definitivamente.

RESUMEN Y CONCLUSIONES

1. El chasquido y fijación de la articulación témporomaxilar no es una entidad rara, algunas veces es bilateral y se presenta a cualquier edad pero generalmente en la mujer de mediana edad.

2. Estos síntomas tienden a presentarse en personas que tienen una cápsula articular laxa.

3. La causa más frecuentemente del trastorno es probablemente el disco interarticular que es móvil ó esta desplazado.

4. El padecimiento debe ser tratado sobre principios que estan ahora bien establecidos con relación a trastornos semejantes de la articulación de la rodilla.

5. Se discuten la anatomía de la región y la causa de los síntomas y se revisa la literatura reciente sobre el tema.

6. Se da suficiente detalle para ayudar a aquellos interesados en este tema con el diagnóstico y tratamiento quirúrgico.

7. El resultado postoperatorio es satisfactorio aun cuando el resultado inmediato puede no ser dramático y alguna limitación del grado de abertura de la boca puede hacerse permanente.

RIASSUNTO E CONCLUSIONI

1. La crepitazione, lo scatto ed il blocco dell'articolazione temporo - mandibolare, evenienza non rara, si verifica talvolta bilateralmente e in ogni età, ma preferibilmente nelle donne di mezza età.

2. Tali stati patologici si verificanco per solito in persone con capsula articolare lassa, benchè ciò non sia sempre necessario.

3. Il disturbo, nel maggior numero dei casi, è probabilmente dovuto ad un disco interarticolare che può essere o anormalmente mobile o del tutto spostato.

4. L'affezione dovrebbe essere curata secondo le direttive ormai ben stabilite per il trattamento di affezioni simili dell'articolazione del ginocchio.

5. Vengono discusse l'anatomia dell'articolazione e la causa dei sintomi e passata in rassegna la letteratura recente sull'argomento.

6. Vengono forniti sufficienti particolari a coloro che si interessano dell'argomento, insieme alla diagnosi e al trattamento operatorio.

7. I risultati della cura chirurgica sono soddisfacenti, benchè possa non esservi un immediato e brillante successo e possano rimanere alcune limitazioni nel grado di apertura della bocca.

RÉSUMÈ

Le déclic, la fermeture avec bruit sec, le collage de l'articulation temporale du mandibule n'est pas une rareté, même bilatérale, chez les femmes d'âge mur surtout. Cette affection se rencontre surtout chez les personnes présentant une articulation plutôt lâche. La cause la plus fréquente est un disque interarticulaire déplacé ou moins mobile. Le traitement s'apparente à celui de l'articulation du genou. Les résultats post-opératories éloignés sont encourageants, même si les résultats immédiats ne le sont pas

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

1. Knacken, Schnappen und Sperre des Kiefergelenks ist keine seltene Erscheinung, besteht manchmal doppelseitig und tritt in jedem Alter auf, besonders aber bei Frauen im mittleren Lebensalter.
2. Die Symptome treten mit Vorliebe bei Personen mit lockere Gelenkkapsel auf, wenn dies auch durchaus nicht eine notwendige Voraussetzung ist.
3. Die häufigste Ursache der Störung liegt wahrscheinlich in einer entweder überbeweglichen oder wirklich verschobenen Gelenkknorpelscheibe.
4. Die anzuwendende Behandlung beruht auf Grundsätzen, die jetzt unter Berücksichtigung ähnlicher Störungen im Kniegelenk allgemein anerkannt sind.
5. Die Arbeit umfasst eine Erörterung der Anatomie des Gelenks und des Zustandekommens der Symptome sowie einen Ueberblick über die neuere einschlägige Literatur.
6. Die Darstellung des Gegenstandes ist genügend detailliert, um denen, die sich dafür interessieren, bei der Diagnosestellung und bei der chirurgischen Behandlung eine Hilfe zu sein.
7. Wenn auch die unmittelbaren Resultate nicht dramatisch sind und eine gewisse Beschränkung in der Fähigkeit, den Mund zu öffnen, endgültig zurückbleiben kann, werden doch die chirurgischen Ergebnisse als befriedigend angesehen.

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Foreign Interns and Residents Available

Approved hospitals in the United States and Canada have openings for interns and residents are requested to communicate with the Secretariat of the International College of Surgeons, 1516 Lake Shore Drive, Chicago 10, Illinois.

Diverticulosis and Diverticulitis

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DIVERTICULA may be described as blind pouches which project from the extraluminal wall of a hollow viscus. They may be single but are usually multiple. They may occur anywhere in the body, but their greatest incidence is in the large bowel. In approximately 70 to 80 per cent of the cases the site of election is the sigmoid flexure of the colon.[1] Unless otherwise anatomically qualified, therefore, diverticulitis is accepted to mean sigmoid diverticulitis.

The term diverticulum is derived from the Latin *divertere*, to turn aside. The suffix *culum* when appended to the verb indicates the diminutive and may be freely translated as "a small turning aside."[2] This description is apt despite its brevity. The lesions do not assume the characteristics of an independent entity but appear rather as projections which have "turned aside" for a variable distance from the parent bowel. In cut section, multiple internal openings are visible (Fig. 1).

Diverticulosis is the term used to indicate the existence of diverticula. When inflammation develops in them, the term diverticulitis is substituted.

Incidence.—The incidence of diverticulosis will probably never be accurately determined, because many persons in whom the lesions exist remain in perfect health and are not examined. Consequently, some observers have declared that the presence of diverticula in the intestine is only of academic interest[3] and merits no greater attention than that accorded the normal appendix or gallbladder.[4] However, while it must be admitted that diverticulosis is essentially innocuous, recent statistics indicate clearly that it is a potential site of inflammation that should not be disregarded. Diverticula of the intestine were observed in 6.9 per cent of a series of 447 cases in which the patients came to necropsy. Roentgenologically, a study of 2,747 cases also revealed the presence of diverticula in the proportion of 7 per cent.[5] The similarity of the statistical result in these two instances appears to be more than coincidental and may well afford the true incidence.

The incidence of transition from diverticulosis to diverticulitis has been reported by different authors as 12 per cent,[6] 17 per cent,[7] 12 to 20 per cent[6] and 11 per cent.[1] In the light of these statistics, therefore, it is reasonable to assume that the transition from diverticulosis to diverticulitis may be considered approximately 13 to 15 per cent.

Sex: Sex does not play as important a role in diverticulosis as was previously believed. Earlier ratings gave a higher incidence in the male, but subsequent investigations reduced the ratio to approximate equality.[8] Diverticulitis, however, appears to attack the male more frequently—in a ratio of 2.75 to 1.[1] Similarly, in a series of patients (now asymptomatic) with a history of previous diverticulitis, men again exceeded women — but in a lowered ratio—1.25 to 1.[1] It is reasonable, therefore, to adopt the working premise that diverticulosis attacks the two sexes equally and that only in the presence of diverticulitis and its complications does that balance change to a preponderance of male patients.[8]

Age: Diverticulitis is generally considered a disease of the later decades of life, although it has been known to occur earlier. Some clinical observers have reported cases in which it occurred below the age of 50, but none under the age of 30 (Rosser;[1] Fischer.[2] The greatest incidence of

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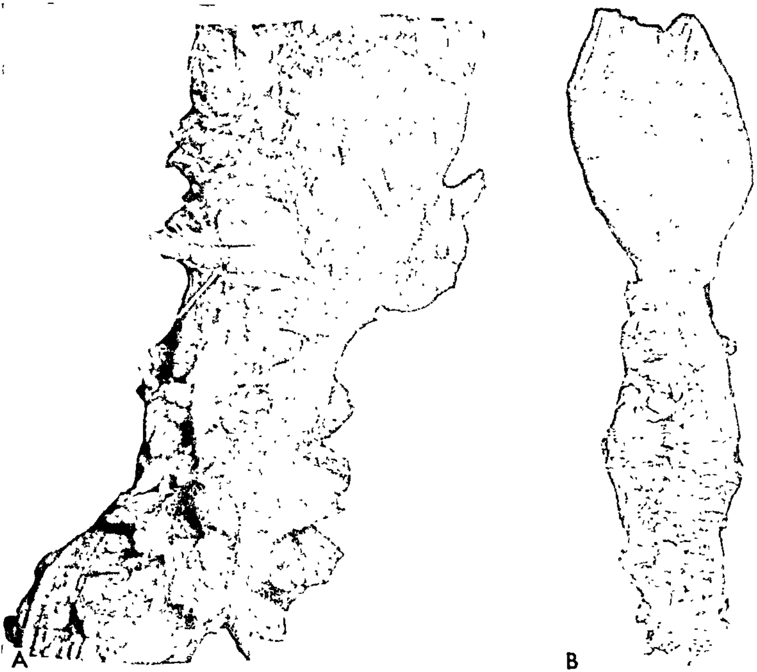


Fig. 1.—*A*, diverticula of the sigmoid. Resected specimen shows multiple saclike lesions which have *"turned aside" from the parent bowel. B, opened sigmoid portion of colon, showing multiple internal openings of diverticula.*

diverticulitis has been established between the ages of 50 and 60, reaching a peak at 59. Thereafter, a progressive decrease in the number of cases has been observed.[9]

It is important, however, to bear in mind that diverticulitis can and does occur in the young. There are references in the literature that report the disease to have occurred in children whose ages range from 9 months to 19 years.[10] Probably the youngest case on record is that of an 18 hours old infant.[11] In some of these cases the lesions were situated in locations other than the sigmoid; in others the process was definitely sigmoidal.

The weight of evidence thus indicates quite clearly that, although in the majority of cases diverticulitis occurs in the fifth decade of life, there are exceptions to this rule which must not be ignored.

Stature and Obesity Numerous efforts have been made in earlier years to relate obesity and stature to the development of diverticulitis. The results have proved of little or no value and have been generally discarded.

Etiologic Factors· There are several theories with regard to the cause and mechanism of the development of diverticula of the intestine.

consider them congenital.[12] Others recognize both a congenital and an acquired type.[13] The latter impression is almost universal today and represents the accepted classification.

Congenital Type: Diverticula in this category are usually single, occur at birth and possess all the coats inherent to the parent bowel. An excellent example of this type is the Meckel's diverticulum attached to the ileum about 3 to 4 feet above the ileocolic junction (Fig. 2).[14]

Acquired Type: Diverticula of this class are generally accepted to be herniations of the mucosa and submucosa through congenitally weak places in the bowel wall. These weak places exist at the point where the blood vessels pierce the muscle coats (Figs. 3, 4 and 5). With this background, an increase in intraluminal pressure is considered adequate as an exciting factor for the initial development of the herniation.[15] The diverticula are usually multiple and, as can readily be seen, are composed merely of mucosa, submucosa and peritoneum (Fig. 6).

The mechanism described by Edwards[16] for the formation of acquired diverticula of the intestine is indeed adequate. He emphasizes the weak spots in the intestinal wall at the point where the blood vessels enter it. He amplifies this by pointing out that these vascular outlets become smaller during the period of relaxation. If contraction of two portions of the intestine occurs with a relaxed segment between them, the bilateral pressure will force the mucosa into the enlarged vascular outlets in the relaxed segment and thus produce the initial herniation which may then progress to full diverticula formation (Fig. 7).

As the diverticula develop they expand into saclike structures of varying size, but

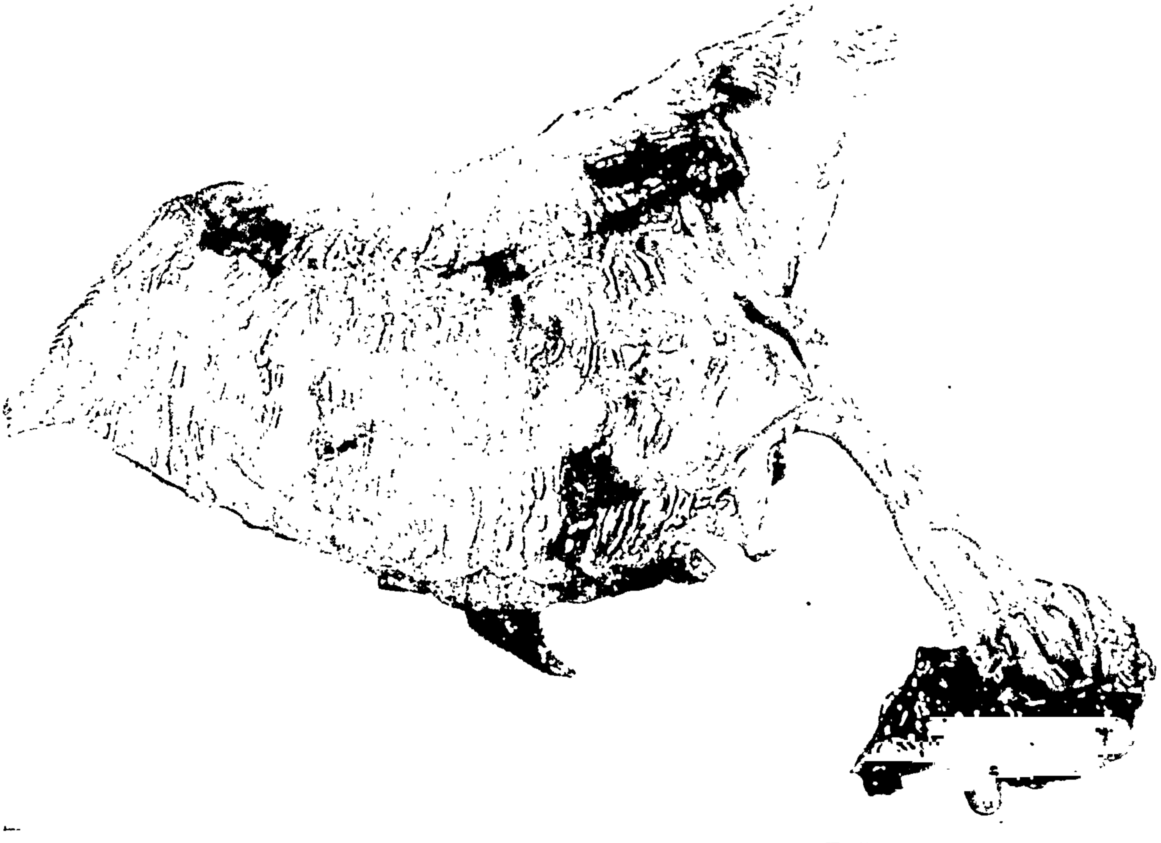
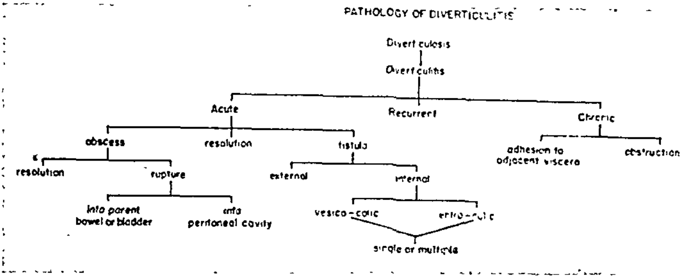


Fig. 2.—Meckel's diverticulum (courtesy of Dr. H. E. Bacon).



Pathologic progression of diverticulosis and diverticulitis.

they retain the small point of their origin, which acts like a collar. This is an important factor in the subsequent development of diverticulitis. Fecal material enters the sac through the constricted neck and is confined therein by the small opening (Fig. 6). A diverticulum has no muscular coat and cannot eject the offending foreign material. As a result, the foreign body becomes inspissated and stagnant; soon ulcerates the lining of the sac and sets up an infection of either a mild or severe nature.

Pathologic Picture. — The pathologic character of diverticulitis is essentially that of inflammation and infection. Any stage may be encountered, from mild inflammation to gangrene-abscess formation, perforation, peritonitis, fistula formation into adjacent organs and obstruction from sigmoiditis and peridiverticulitis may be anticipated.[17] The initiation of inflammatory secondary changes depends upon retention of fecal material in the diverticula. It is axiomatic that this should occur most frequently in the sigmoid, because the fecal stream is more solid in that location than elsewhere in the gastrointestinal tract.[2] The pathologic changes incident to diverticulitis are listed in the accompanying diagram. The most common lesion encountered is an inflammatory process localized to the diverticula. All of the elements of inflammation are present, producing a picture not unlike that seen in acute appendicitis. In addition, there is a characteristic extension of the inflammatory process for a variable distance in the wall of the bowel (Fig. 8 *A*). The inflammation may subside under nonsurgical care and undergo resolution, or it may progress to the formation of an abscess. The abscess may remain static until relieved by operation, or it may rupture (Fig. 8 *B*). If it ruptures into the lumen of the bowel to which it is attached, adequate drainage may result, with a corresponding spontaneous cure. If it ruptures into the peritoneal cavity, peritonitis with its attendant complications will result. It may be timely at this point to mention the possibility of rupture of an inactive diverticulum when the host is exposed to high altitudes. A patient has been brought to my attention who suffered this accident while flying in a commercial plane. Operation revealed a ruptured diverticulum. No history of previous diverticulitis was available.[18] Advances in commercial aviation, including the proposed sealed cabin to eliminate excessive pressure, will provide the solution of this problem. It is of extreme interest, however, to correlate the influence of high altitude pressure on diverticula with the current conception of the pressure theory of its causation.

Extension of the inflammation into adjacent organs is fortunately rare. The resultant fistula usually involves the urinary

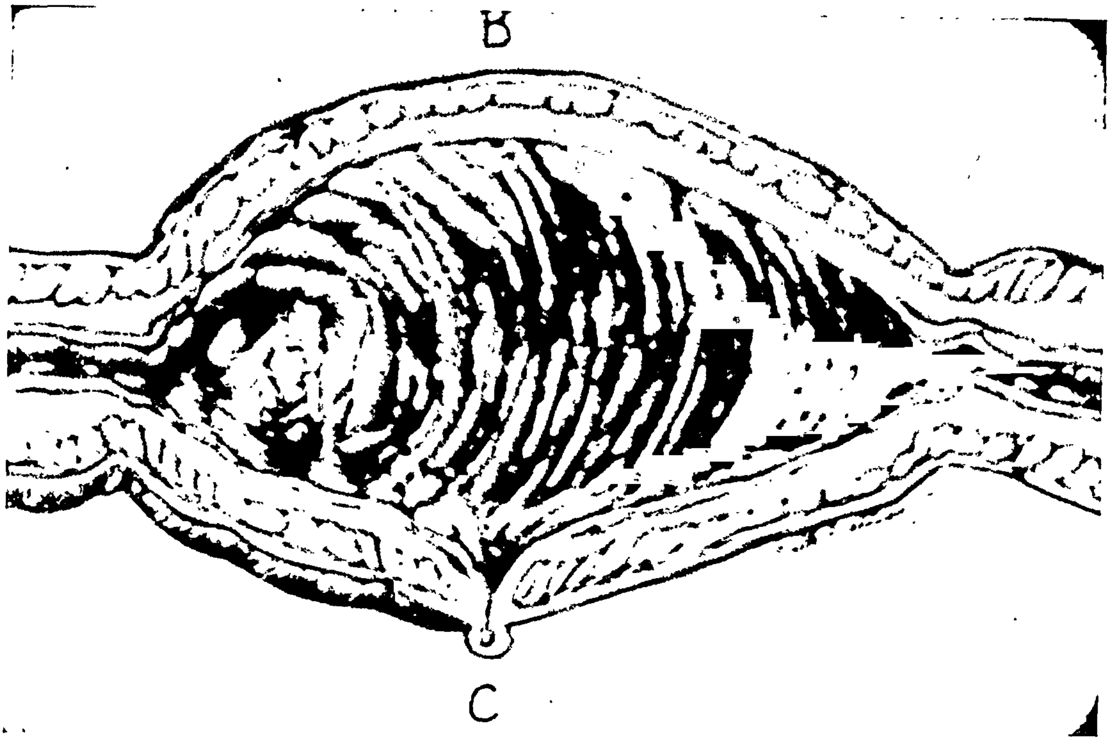


Fig. 7 (After Edwards).—Diverticulum forming at *C* in the dilated segment from pressure of the contracted segments on either side.

toms are not specific for diverticulitis and serve merely to indicate intra-abdominal inflammation. In the presence of obstruction due to chronic diverticulitis, they may appear as late symptoms.

Blood and Mucus: The passage of blood from the bowel in cases of diverticulitis is an inconstant factor. It has been reported in widely separated clinics to have occurred in 7 per cent, 16 per cent and 20 per cent of the cases investigated.[24] The bleeding has varied from a slight amount to an amount described as massive hemorrhage.[25] Some of the more competent observers ascribe little significance to it, preferring to assume that proctoscopic examination will reveal other causes for the sign.[26] They do admit, however, that bleeding has occurred in some of their cases for which they could find no other explanation despite the most careful study. Other observers, equally competent, have adopted the view that rectal bleeding, when it cannot be accounted for by an associated lesion, should be regarded as a symptom of diverticulitis.[27]

The mechanism of the bleeding is unknown. One report suggests that it may be due to rupture of a vessel in the thinned wall of the diverticula.[28] That theory is, however, empiric rather than practical. It is our view that, while hemorrhage in diverticulitis is neither a predominant nor constant factor, it would be unwarranted to disregard it entirely.[29] The appearance of mucus in the stools has been noted in a small percentage of cases. It is no more characteristic than the mucus associated with constippation and occurs too infrequently to be endowed with any diagnostic significance.[30]

Tenderness and Abdominal Rigidity: In most cases of diverticulitis, these signs are present in the left lower quadrant of the abdomen, directly over the lesion. Occasionally they may reach their maximum intensity over the area of associated colonic spasm. The degree of tenderness and muscular rigidity is increased with the development of an abscess and becomes generalized in the event of perforation and peritonitis.

Tumor Mass: Palpation of a tender mass in the left iliac fossa is a fairly reliable sign of diverticulitis, but in approximately 55 per cent of cases no mass can be felt. If one is present, it is usually sausage-like or spindle-shaped, immovable and tender, and must be differentiated from carcinoma.

Symptoms of Fistula Formation· There are no specific symptoms to indicate either an imminent or an actual fistula into a neighboring loop of bowel. The established fistula is usually revealed by the roentgenogram or by operation. A fistula into the urinary bladder, on the other hand, will usually serve premonitory notice of its imminence. A history of pain, frequency, burning and nocturia warns of adhesion to the bladder. The added presence of pyuria is strong presumptive evidence that a colovesical fistula is imminent. When the fistula becomes established, the urine will become foul and progressively severe cystitis will develop. The passage of fecal material in the urine has been noted in several of our cases.

Sigmoidoscopic Data.—In recent years more frequent and efficient use of the sigmoidoscope has yielded considerable diagnostic information. A group of five signs has been designated for the recognition of diverticulosis and diverticulitis and has proved to be of value.[28] In a series of 242 cases it was possible through the use of these signs to diagnose the lesion successfully in 160 cases (66 per cent). The signs are:

1. Limited mobility of a segment of the bowel associated with limited mobility of the adjacent structures.

2. Angulation of the bowel. When present, this feature occurs at the point where the inflammatory process immobilizes the colon and it is practically impossible to pass the instrument beyond it.

3. Reduced lumen and adherent mucosal folds. The former is due to contracture of the fibrous tissue which has infiltrated the wall of the bowel. It follows inevitably that, as the contraction progresses, the mucous folds are crowded together and become adherent. It is not unusual for the folds to become edematous.

4. Sigmoidal sacculation. These are represented as shallow pouches or depressions which may extend partially or completely around the wall of the bowel. In a mobile sigmoid that bears no evidence of inflammatory disease, ridges separating the pouches can often be seen. They may represent a prediverticular state and are best visualized when the bowel is distended with air. A similar observation was made twenty years ago by Spriggs and Marxer.[7] They studied a large series of roentgenograms of the colon and described a "prediverticular state" in which normal segmentation of the bowel was replaced by a "ragged outline of little convex irregularities."

5. Actual visualization of the openings of the diverticula through the sigmoidoscope. Although these signs may be seen separately, they usually occur in combination. It may not be possible to make a definite diagnosis on the basis of their presence alone except when the diverticula are actually visualized. When they are present, however, they indicate the presence of diverticula.

Roentgenologic Data.—The barium enema is the most accurate and effective diagnostic agent available. Its greater use today is responsible for the markedly increased number of patients in whom the lesions are now demonstrated. While the barium meal will almost always show the diverticula in the colon, it is not as efficient as the barium enema, in which the barium is introduced under pressure.[31] Consequently, the barium enema is now used almost universally, either alone or followed by the injection of air. The latter, or double contrast, method is preferred by some surgeons, who claim that it gives the diverticula a more positive outline and demonstrates more fully the extent of involvement of the colon.[32]

It is of vital importance, however, to realize that the barium enema is not infallible. By reason of spasm or orificial constriction the barium may not enter the sacs and a negative report will result. If the symptoms persist, reexamination should be insisted upon. It is equally vital to realize that a roentgenogram taken with the patient in one position may fail to reveal the lesions, while a film taken at another angle may demonstrate them with great clarity. The most effective routine should include anteroposterior, left oblique and right oblique views.[31] In the prediverticular state, the roentgenogram will usually show replacement of the normal segmentation of a small portion of the sigmoid by a unilateral, ragged irregular, saw-toothed marginal outline (Fig. 9*A*). In the same film all of the stages of diverticulosis may be demonstrated. Larger sacculations may be clearly visualized and assume widely divergent shapes and groupings. Some appear round, others ovoid and still others semiglobular. They may occur single or in oddly-patterned groups (Fig. 9*B*). They may appear as a chain of opaque dots in a double row connected with the lumen of the bowel by short, narrow necks (Fig. 9*C*). When fecal concretions are present, the barium will fill the sacs around the foreign body and produce a variety of shapes, such as crescents and finger-like shadows.[33] The deep indentations of the bowel haustra indicate spasm and are interpreted either as evidence of the existence of a prediverticular state or as indicative irritability due to an associated inflammatory process. In the chronic obstructive type with tumor formation, a filling defect that simulates carcinoma may be visualized.

The differential diagnosis is often difficult and on occasion cannot be made with any degree of certainty. There are a few roentgen signs, however, that may give the clue to the true nature of the condition.[34] In cases of diverticulitis the mucosal relief view of the colon does not show as extensive destruction of the mucosa as is associated with carcinoma.[31] The picture in cases of malignant disease is constant, while in cases of diverticulitis the defect as well as the tumor has a tendency to change.[31] In the presence of diverticulitis the obstruction is usually incomplete and occurs as a late manifestation;[31] the defect is usually fusiform or spindle-shaped and is longer than the short, abruptly-demarcated lesion of carcinoma.[35]

Not infrequently the rising column of the barium enema may be seen to halt abruptly and no more of the solution can be introduced. The presence of an obstructive lesion is apparent, but a differential diagnosis from the film is impossible. At this time a roentgenogram taken after oral administration of barium would yield invaluable information. Its use, however, has always been considered a dangerous practice, because of the fear that it would aggravate the existing obstruction. Such an impression is undoubtedly warranted if the customary solution is used. In recent months, however, Wyatt[18] has developed a technic for the oral administration of barium which eliminates that danger. By adding magnesium citrate to it, he has been able to produce an opaque medium that will maintain its liquid state permanently. As a result, its administration orally does not result in impaction proximal to the lesion. We have applied this method in several cases, with gratifying results. A detailed report of the technic will appear in the literature in the near future.

Colovesical and enterocolic fistulas are visualized by the passage of the opaque solution from the sigmoid into an adjacent loop of bowel or into the urinary bladder. The tracts are not always distinct, particularly if an enterocolic fistula is present. With the colovesical fistula, the more common of the two, the tract is more distinct and more visualized.

Diverticulitis and Carcinoma. — Early observers were of the opinion that diverticulitis was a predisposing factor in the development of carcinoma of the intestine. The prevailing opinion at present is at variance with that theory. Ochsner and Bargen[24a] observed malignant disease of

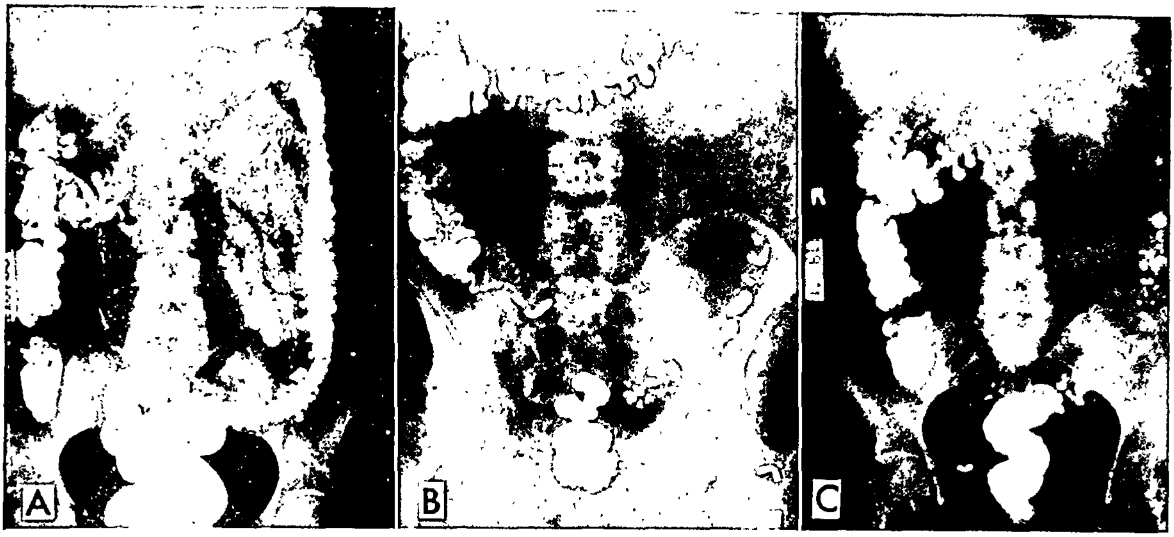


Fig. 9.—*A*, roentgenogram showing irregular sawtooth outline of sigmoid. Larger diverticula may also be seen. *B*, multiple diverticula. Note variety of sizes and shapes. *C*, diverticulosis. Note apparent double row of sacs connected with lumen of bowel by short, narrow necks.

the colon in only 6 per cent of 13 patients in whom diverticula were known to exist. In only 7 of these was malignant disease observed in the same portion of the colon in which the diverticula were situated. Rankin and Brown[6] noted carcinoma in only 4 of 227 cases of diverticulitis and concluded that the relation between carcinoma and diverticulitis was incidental rather than actual. Since both diverticulitis and carcinoma of the intestine occur in the latter decades of life in the majority of cases, it is reasonable to expect some percentage of coincidental involvement, either in the same area or in remotely separate regions (Fig. 9*B*).[36]

Diagnosis.—The diagnosis of diverticulitis is not always simple. The symptoms, already enumerated, vary widely in their intensity, and one or more of the signs may be absent. The barium enema provides the most reliable means of establishing a diagnosis. Eggers[37] has declared that "the most valuable symptom is to bear a diagnosis of diverticulitis in mind." Rosser's[38] diagnostic formula is apt. He has declared that "a combination of low-grade temperature, tenderness in the left lower quadrant with or without the presence of a palpable mass, and sigmoidoscopic evidence of fixation of the lower colon, especially in an individual over fifty, are indications that careful radiographic studies of the colon are in order."

Differential Diagnosis: The salient points of differential diagnosis are presented in Tables 2 and 3.

Prognosis.—The prognosis of diverticulosis is uniformly good. Although most of the patients remain asymptomatic, approximately 15 per cent will suffer the transition to diverticulitis. When this occurs, the prognosis becomes progressively worse in direct proportion to the severity and extent of the inflammatory process. The extensive surgical procedures that may be required provide an additional prognostic risk. In our group of 23 cases of diverticulitis, resection was carried out in 17. In 4 the exteriorization method of Miculicz was employed; in 3, abdominal, perineal proctosigmoidectomy, and in 4, immediate end-to-end aseptic anastomosis. In the last-mentioned group, complemental appendicostomy or transverse colostomy was instituted at the time of operation. In 6 patients, anterior resection of the sigmoid with colostomy and extraperitonealization of the closed rectal stump (Hartmann technic) was done

TABLE 1.—*Differential Diagnosis of Acute Diverticulitis*

Points of Difference	*No.*	*Acute Diverticulitis*	*Acute Appendicitis*	*Ureteral Colic*	*Pelvic Inflammatory Disease*
Previous history	1	None *	None	None	Exposure
Age	2	55-60 *	Younger	Any age	Younger *
Fever	4	Low grade *	Low grade	None	Elevated
Pain	5	Moderate *	Moderate	Severe	Moderate to severe
Tenderness	6	Moderate *	Moderate	Moderate to severe	Severe
Site	3	Left-sided	Right-sided	Either side	Bilateral
Nausea and vomiting	7	Negative *	Positive	Positive	Negative
Rectal bleeding	8	May be positive	Negative	Negative	Negative
Abdominal tumor	9	May be positive	Negative	Negative	Negative *
Pelvic examination	11	Negative	Negative	Negative	Bilateral tenderness
Sigmoidoscopic examination	12	May be positive	Negative	Negative	Negative
Roentgen examination	14	Presence of other diverticuli *	Negative	Shows stone shadow	Negative
Urine	10	Negative	Negative	RBC and WBC	Negative
Cystoscopic examination	12	Negative	Negative	Positive	Negative
Vaginal smear	15	Negative	Negative	Negative	Positive for G.C.

* Usually

in spite of the fact that partial cystectomy was included in 4 instances. Of the 17 patients who underwent resection, 1 died—a mortality rate of 5.8 per cent. This occurred as the result of peritonitis following a resection with end-to-end anastomosis. Of the 6 patients operated upon but without resection, 2 died; 1 after colostomy for obstruction and the second after abscess formation treated by incision and drainage, making a total mortality of 13.4 per cent.

Treatment.—The treatment varies with the type and degree of inflammatory involvement. For patients with diverticulosis and uncomplicated diverticulitis the management is medical, designed toward keeping the diverticula empty.

Diet: A bland, nonirritating diet free of residue is advocated. All fruits with seeds should be avoided. Rough, raw or stringy vegetables are similarly undesirable. Fish should be filetted and all bones carefully removed. If constipation becomes troublesome as a result of the diet, fruit juices may be taken in more liberal quantities. Alcohol may be used in moderation.

Bland, Low Residue Diet

Breakfast

Orange juice
Eggs, 2
Cream of wheat
Toast
Butter
Cream
Milk
Sanka coffee or tea

Dinner

Minced chicken or lamb or broiled filet of sole
Pureed stringbeans
Pureed carrots
Diced potato
Toast, one slice, or 2 crackers
Butter
Milk
Cream
Sanka coffee or tea
Strained stewed fruit, junket or custard

Supper

Cream of celery soup, strained
Asparagus on toast
Pureed beets
Cream cheese
Crackers, 2, or one sli of toast
Butter
Milk
Cream

gen, die chirurgisches Eingreifen erfordern, werden erwähnt unter Angabe der vom Verfasser bevorzugten Verfahren.

RESUMEN

Se discute la naturaleza, incidencia, diagnóstico, clasificación, características patológicas y síntomas del diverticulo Se resumen las técnicas sigmoidoscópicas y roentegenológicas y se examina la incógnita de una relación entre diverticulitis y carcinoma. Se delínea el tratamiento, incluyendo lista de la comidas recomendadas y de las que deben evitarse. Se mencionan las determinantes de la intervención quirúrgica con las recomendaciones del autor concernientes al procedimiento de elección.

RÉSUMÈ

L'auteur discute de la nature, de la fréquence, du diagnostic, de la classification, de la pathologie et des symptomes du diverticule. Les avantages du sigmoïdoscope et de la radiographie sont aussi présentés. Il note une certaine analogie entre le diverticule et le cancer. Le traitement à suggérer, la diète recommandable dans ces cas et le procédé chirurgical idéal sont aussi énoncés par l'auteur.

SUMARIO

São discutidos a natureza, incidencia, diagnostico, classificação, aspéto patológico e sintômas dos diverticulos. As técnicas da reto-sigmoidoscopia e do estudo radiologico são salientadas, sendo ainda devidamente apreciada a relação existente entre a diverticulite e a carcinomatose. O tratamento, inclusive os alimentos que devem sêr ingeridos e os que precisam sêr evitados, é detalhado, sendo, por fim, mencionadas as condições que reclamam o tratamento cirúrgico, fazendo o autôr as suas recomendações para os processos a sêrem adotados nêsses casos.

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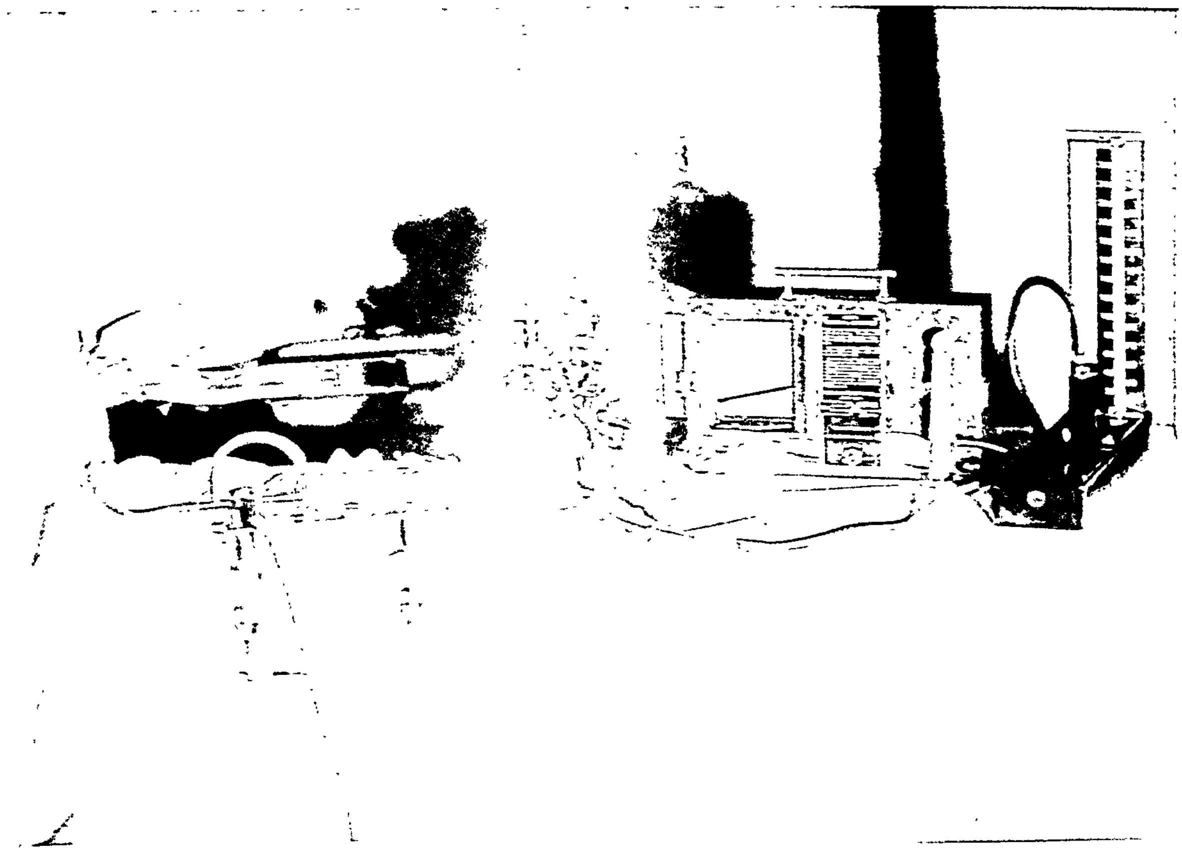


Fig. 4.—Complete apparatus assembled for perirenal oxygen insufflation.

danger of emboli due to the injection of gases, with unconfirmed conclusions, had led to fear of using a most valuable diagnostic procedure. It is with this thought in mind that we have undertaken a restudy of the various gases used today.

The ideal gas should be innocuous, nonirritating, easily disseminated, readily absorbed and miscible with blood. Air has been used for more than thirty years with few untoward effects. Oxygen, carbon dioxide and helium have also been advocated and used. All these gases are relatively safe when injected under controlled manometric pressure. We have found, after experimentation with the commoner gases, that oxygen is the most satisfactory and least dangerous of all because of its rapid absorption and miscibility with blood. Oxygen injected intravenously into rabbits caused no reaction and was readily absorbed from the perirenal areas within forty-eight hours. Carbon dioxide was as readily absorbed as was oxygen, but intravenous injection of this gas caused slight convulsive reactions, with no serious consequences. Helium,[5] however, was absorbed very slowly and remained in the perirenal areas more than five days after perirenal insufflation. When injected intravenously into rabbits, helium caused death instantaneously by filling the right auricle and ventricle and inducing tonic contraction of the left ventricle.

In the early period when Carelli's method was first employed, reports of deaths from emboli were emphasized. However, this diagnosis was rarely, if ever, confirmed at the autopsy table. In order to reduce to a minimum any complications of perirenal insufflation, the pressure under which the gas is introduced should be lower than the diastolic blood pressure; this decreases the possibility of gas entering the vascular system. A new apparatus has been devised for accurate measurement of the quantity of gas injected and for recording the pressure under which the gas is introduced.

The ingenuity of Mr. Fred Wallace made this apparatus available. It consists primarily of a 50 cc. syringe connected to a three-way stopcock, both of which are mounted on a metal stand. All parts are easily disassembled for cleaning and sterilization. The three-way stopcock is arranged in such a fashion that there is never a direct continuity between the tank of oxygen and the patient. One outlet of the stopcock is connected to the tank of oxygen; the second outlet is connected by tubing to the needle which is inserted into the patient, this outlet having a sheath which is hooked up to a pressure-recording apparatus, such as the Lewis cystometer; and the third outlet is connected to a syringe, whereby the quantity of gas is measured. In this fashion a measured amount of oxygen is introduced under controlled and recordable pressure.

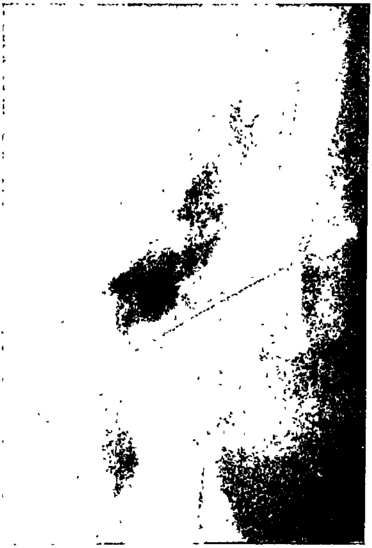


Fig. 5.—Position of needle *in situ* during lumbar perirenal oxygen insufflation.

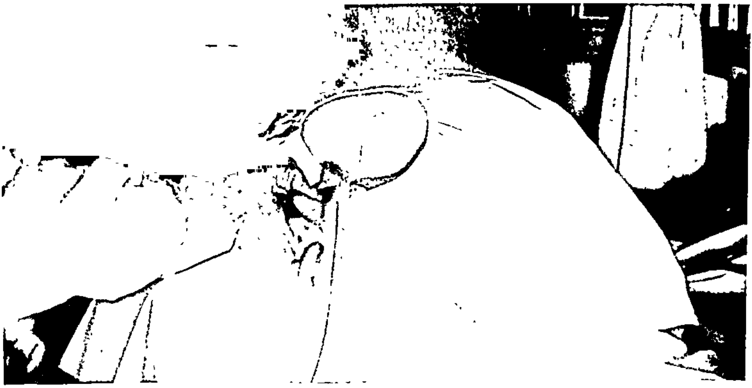


Fig. 6.—Position of patient with needle *in situ* during presacral oxygen insufflation.

anterior portion of the abdomen is frequently noted. It is our practice to stop when this occurs. After the desired amount of oxygen has been injected, the patient is instructed to turn on his or her back.

10. The hands are now clasped by an attendant, and anterior flexion and extension of the body is carried out in a rowing motion.

11. Roentgenograms are taken immediately.

12. An excretory urographic study may now be added and, if necessary, a retrograde pyelographic investigation.

13. In many instances a twenty-four film is taken.

Advantages and Indications.—The following points are worthy of attention:

1. Perirenal insufflation clearly delineates the exact size, form and location of kidney, thus providing valuable information in unusual cases of ptosis, rotation, failure of rotation, malformations, agenesis, atrophy, etc.

2. A combination of pyelographic investigation and perirenal oxygen insufflation provides an accurate estimation of viable parenchymal tissue in cases of hydronephrosis, calculi, cysts, etc. This is of inestimable importance when conservative surgical treatment is contemplated.

3. Changes in density of the renal shadow are clearly illustrated.

4. The technic may outline renal calculi

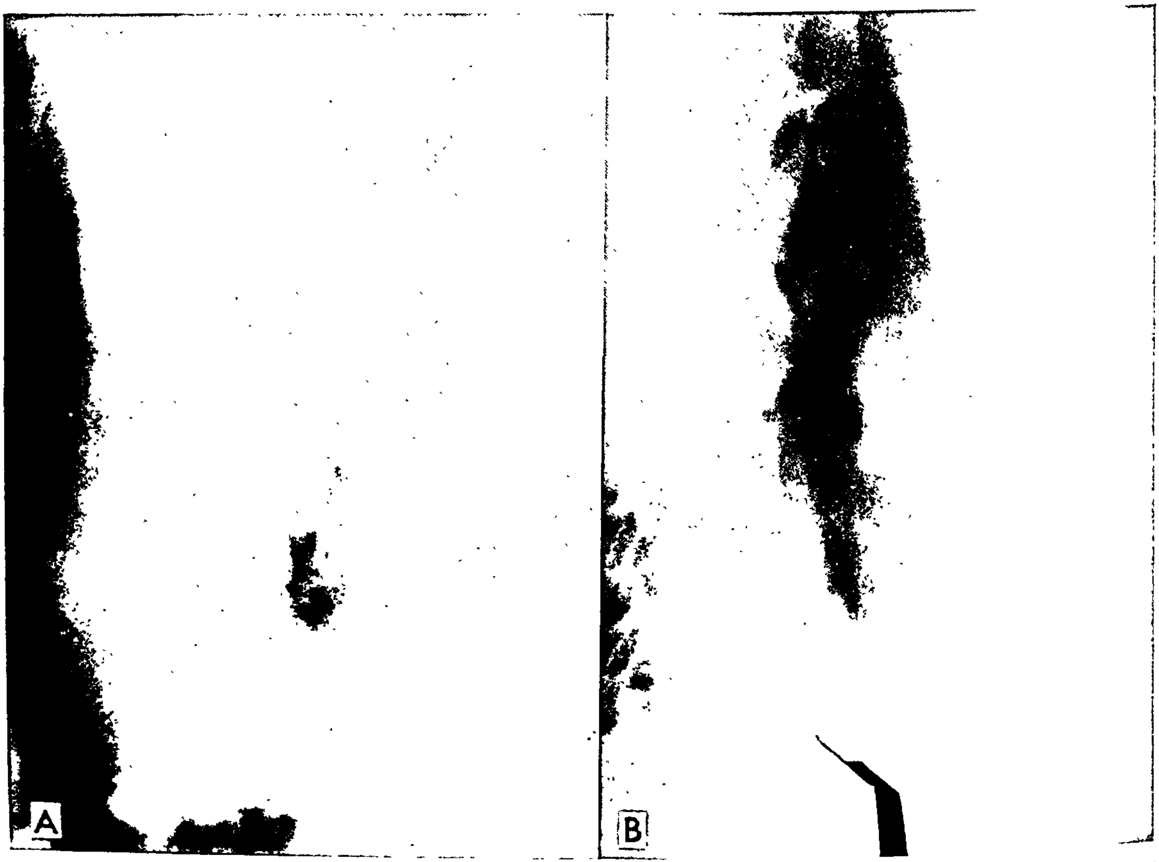


Fig. 10.—*A*, patient with large mass in right side of abdomen. Perirenal insufflation shows a normal kidney. Mass is carcinoma of liver proved at exploratory operation. *B*, perirenal insufflation demonstrating normal adrenal gland above the kidney (Carelli technic).

and parenchymal calcifications not visible by ordinary radiographic methods.

5. The ureters are well outlined, and ureteral pathologic conditions, such as strictures, bands, adhesions, anomalous vessels, etc., may be diagnosed with accuracy.

6. Information is provided of pathologic conditions in the subdiaphragmatic and retroperitoneal areas, such as perinephritis, perinephric abscess, cysts, tumors and the results of trauma.

7. Parenchymal tumors and cysts are outlined, and information concerning the extent of perirenal involvement is provided.

8. The relation of the kidney to other tumors and cysts, intraperitoneal or retroperitoneal, is made manifest.

9. Perirenal insufflation is extremely valuable in the study of the adrenals, particularly by the presacral route because the two sides are simultaneously outlined for comparison.

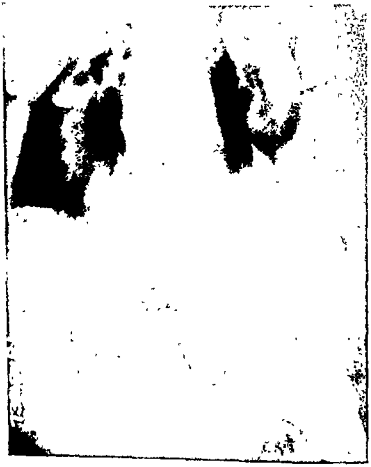
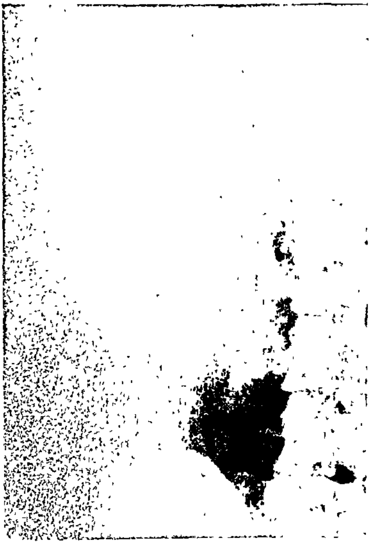


Fig. 11.—Rivas technic, demonstrating oxygen around both kidneys excluding possibility of perirenal inflammation in a case of alleged trauma to left kidney.



[illegible] Large renal tumor filling entire right abdomen. Perirenal insufflation shows [illegible] free of any attachment to surrounding [illegible]. Patient was operated upon; tumor and kidney successfully removed.

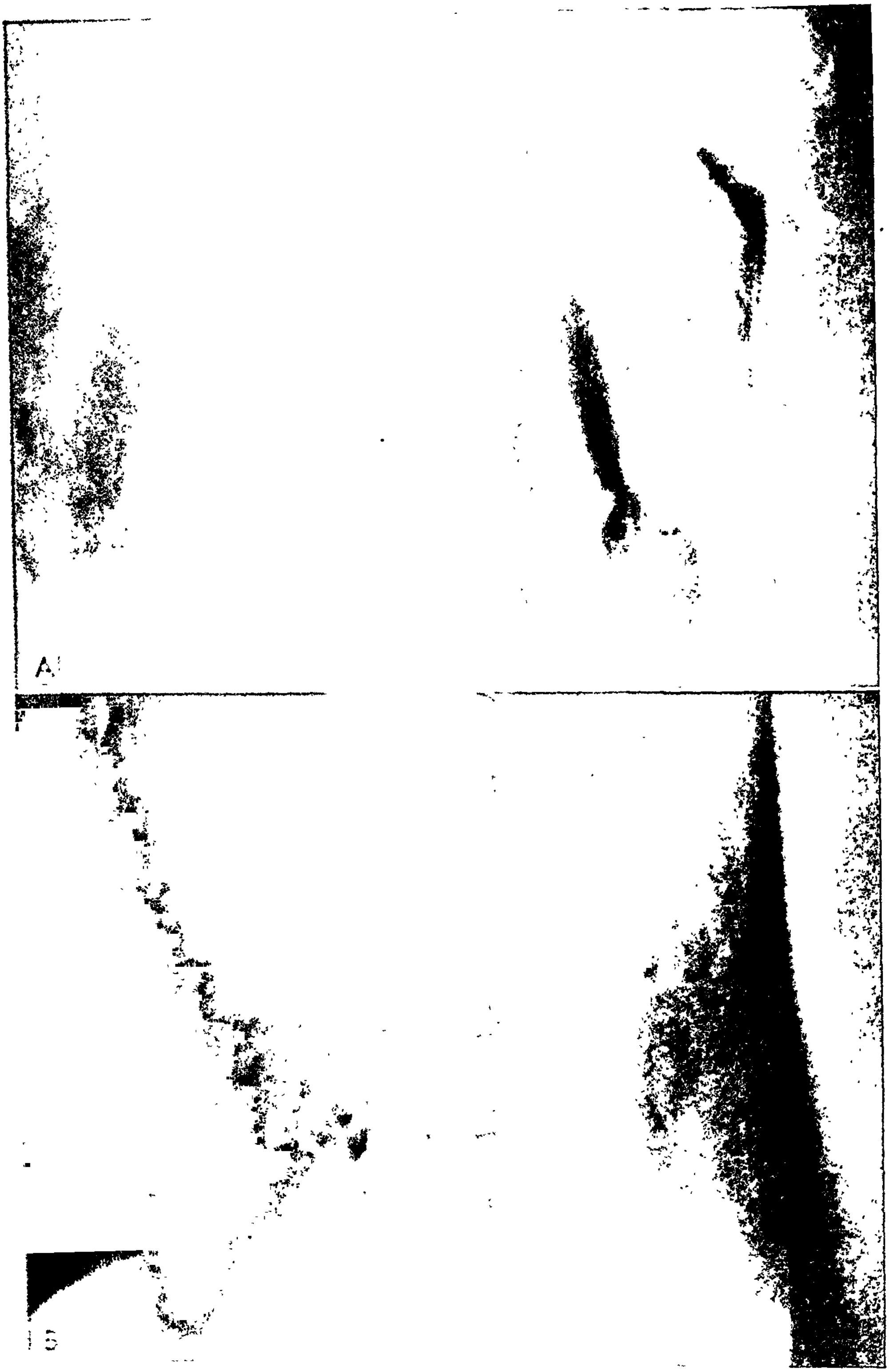
Disadvantages and Contraindications.—Possible disadvantages and contraindications connected with the lumbar or direct approach are as follows:

1. Danger of accidental perforation of the peritoneum, bowel and blood vessels.

2. Danger of penetration into a tumor and subsequent dissemination of the tumor cells.

3. Danger of spreading infection in cases of perinephritis, abscess, tuberculosis, etc.

4. Technical difficulties, which are frequently encountered in the proper introduction of the needle.



[illegible] *A*, [illegible] in a case of tuberculosis of lower [illegible] owing to diffuse perinephritis. *B*, [illegible] No oxygen passed around kidney. [illegible] of perinephritis.

By the presacral or indirect approach all the aforementioned disadvantages are obviated. The technic is relatively simple, and no accidents or contraindications have been encountered.

It is evident from these preliminary remarks that pneumoroentgenographic study is a relatively safe practice and may be approached with little or no hesitation.

In conclusion, it is with the hope of stimulating the freer adoption of perirenal insufflation as a valuable diagnostic addition to the urologic armamentarium that this presentation is made. Fear of serious complications is entirely obliterated when one employs the apparatus here described and exercises the average precautions emphasized earlier in this presentation.

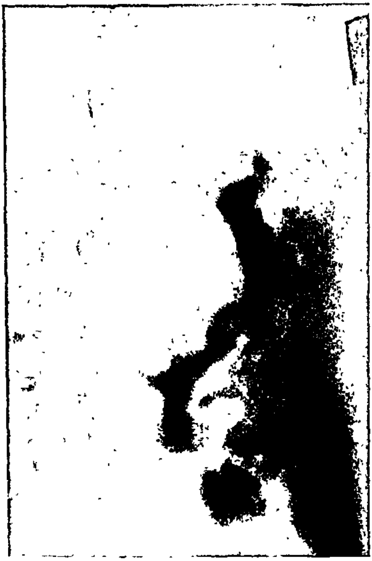


Fig. 14.—Perirenal insufflation demonstrating a pheochromocytoma.

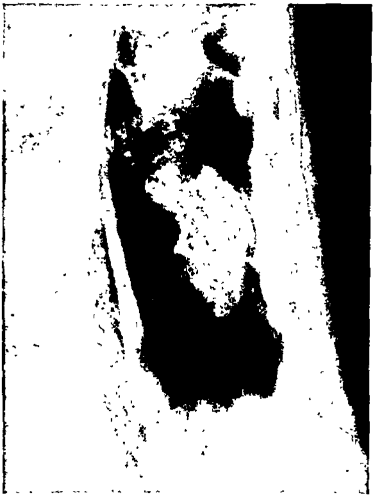


Fig. 15.—Perirenal insufflation demonstrating a collapsed stomach above kidney, with no tumor; not a case of pheochromocytoma.

SUMMARY

The authors discuss and recommend the use of perirenal insufflation in urologic diagnosis, emphasizing, on the basis of their own experience, the fact that the procedure need not be dangerous if properly handled. Complete outlines of their lumbar and sacral insufflation technics are included, together with a detailed list of indications for this diagnostic measure and the advantages it affords.

RESUMEN

Los autores discuten y recomiendan el uso de la insuflación perirenal en el diagnóstico urológico, haciendo notar conforme a su experiencia el hecho que dicho procedimiento no es peligroso manejado apropiadamente. Se incluyen los lineami-

todas as indicações para êsse meio diagnostico, e bem assim as vantagens por êle trazidas à clínica.

ZUSAMMENFASSUNG

Die Verfasser erörtern und empfehlen die Anwendung perirenaler Einführung von Gas in der urologischen Diagnostik. Sie betonen, dass auf Grund ihrer eigenen Erfahrungen die Methode, richtig angewandt, keinerlei Gefahren einzuschliessen braucht. Genaue Beschreibungen der von den Verfassern benützten lumbalen und sakralen Einblasungstechniken und eine genaue Aufzählung der Indikationen und der Vorzüge des Verfahrens sind eingeschlossen.

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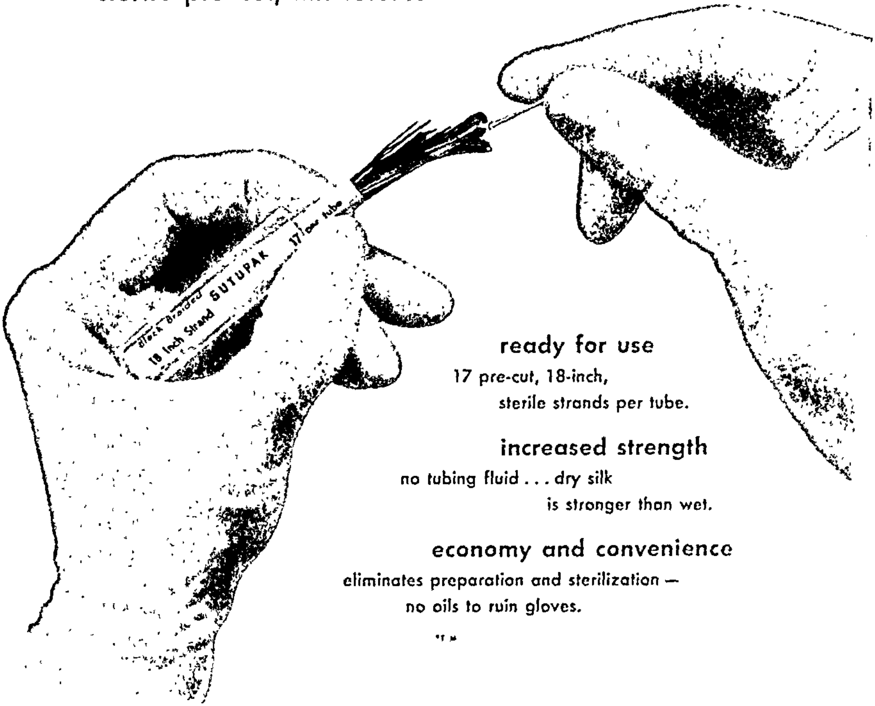

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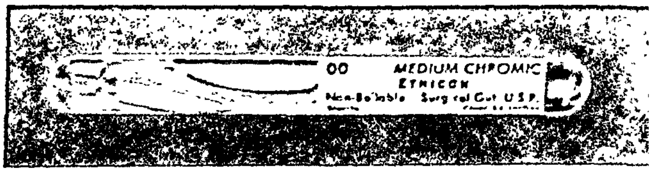

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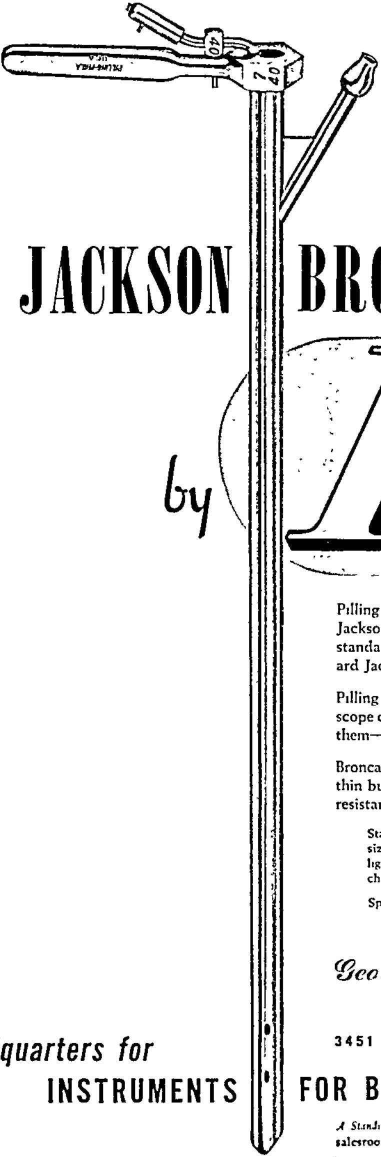

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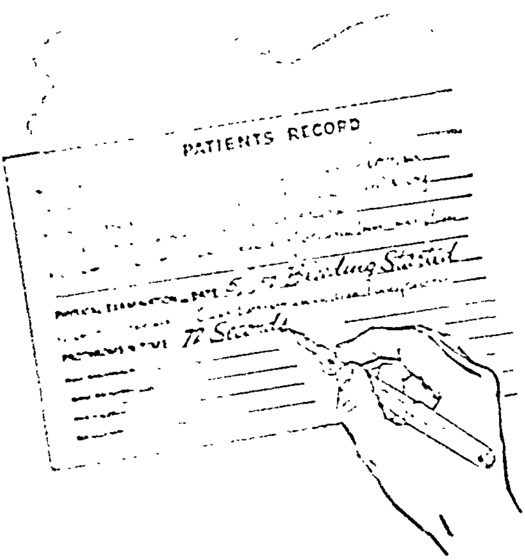

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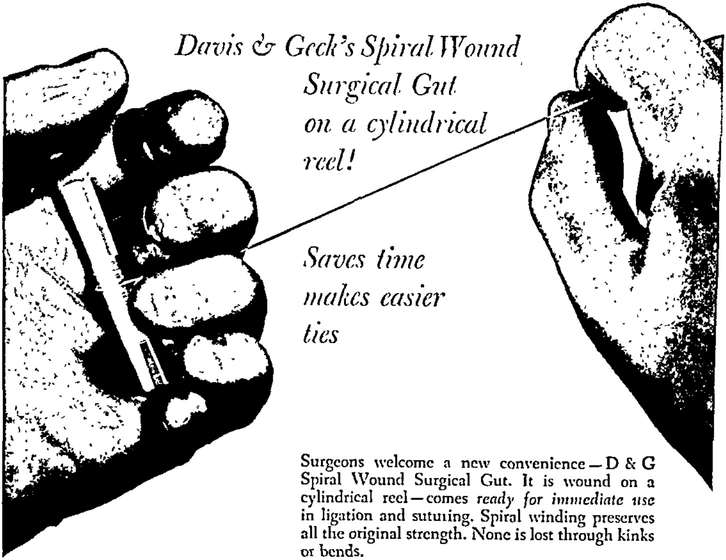

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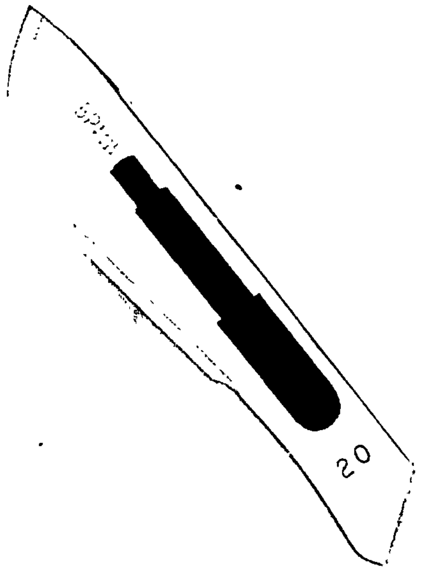

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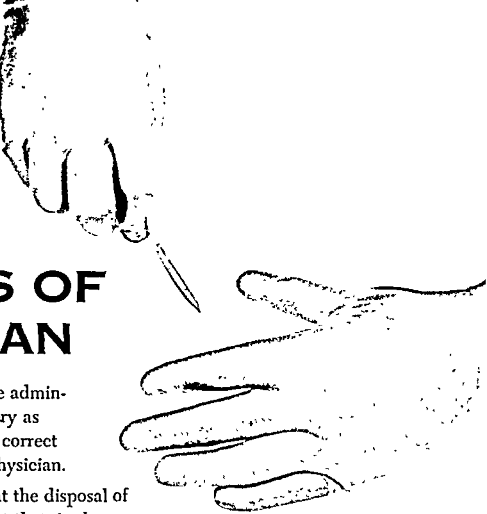

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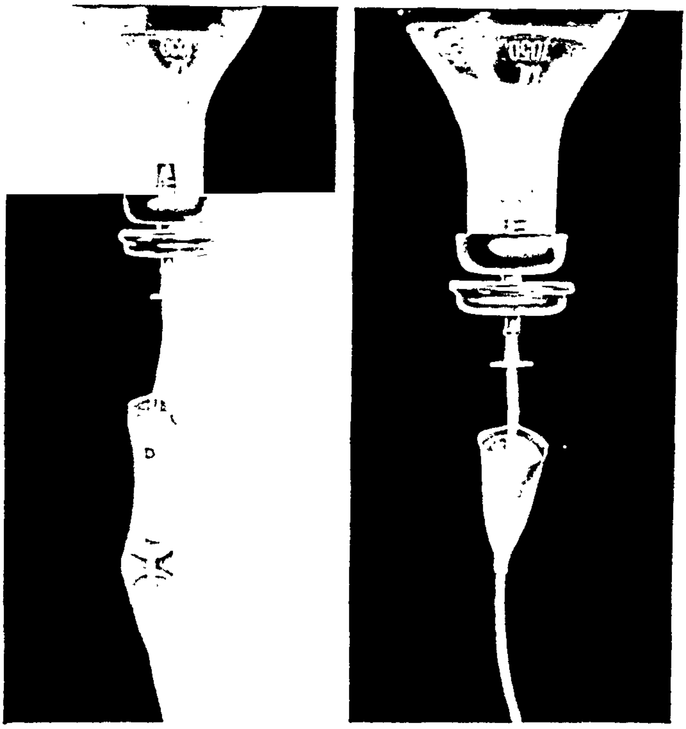

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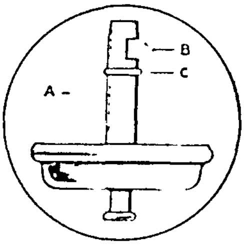

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*Sack, Theodore et al: The Preservation of Whole ACD Blood Collected, Stored and Transfused in Plastic Equipment. Surg Gyn Obst 95 113-119, 1952

Walter, Carl W.: A New Technic for Collecting, Storage and Administration of Uncontaminated Whole Blood [illegible]

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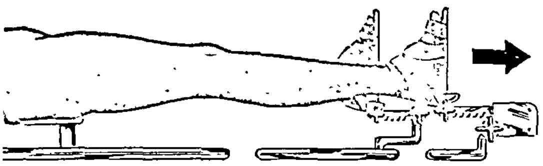

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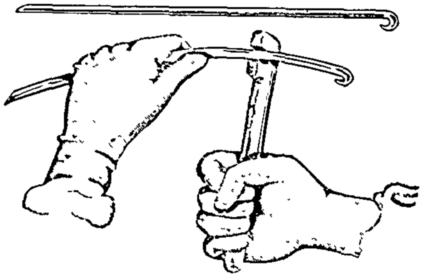

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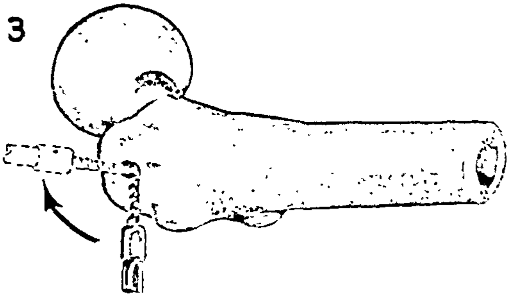

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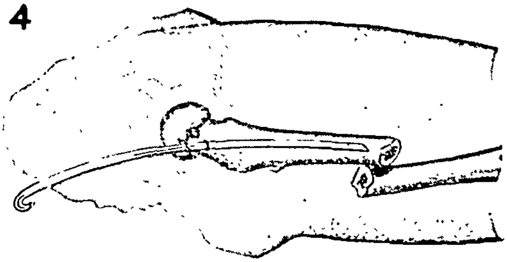

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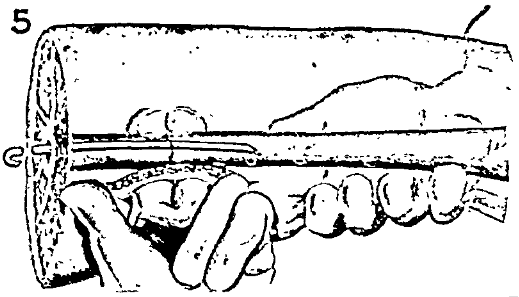

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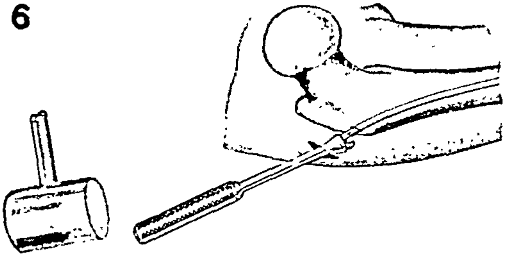

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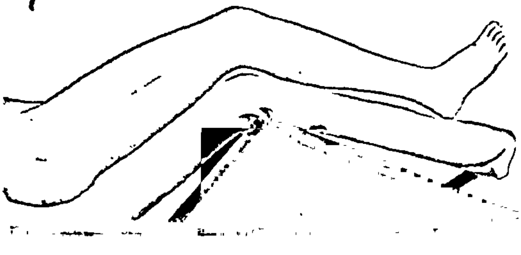

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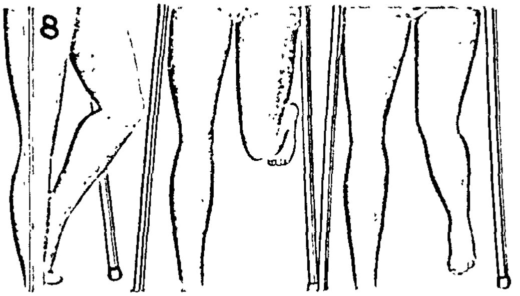

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Vol. XIX MARCH, 1953 No. 3

Original Articles

Pain: Its Significance to the Surgeon

R. J. BEHAN, M.D., DR. MED. (BERLIN), F.A.C.S., F.I.C.S.
PITTSBURGH, PENNSYLVANIA

THE surgeon who chooses the subject "Pain: Its Significance To The Surgeon" must ask the kind indulgence of his readers for entering upon a realm in which the lack of knowledge seems so profound that frequently it must appear to the average physician to be a waste of effort, or a useless procedure, to try to fathom the significance of the numerous pains that he encounters. However, as a physican he must attempt to do so, for the pain may suggest manifold diagnostic possibilities that may aid him in treatment of the conditions causing the pain. This possibility should act as an incentive for him to learn as much as possible about pain, especially since every physician knows that pain is universal and that the bodies of the famous as well as those of the nameless are perpetual sources of pain. Though aware of the importance of pain, cognizant of the fact that any organ of the body may give rise to it and that it is almost inseparably associated with disease, the average physician has only a limited experience in solving the mysteries of pain.

The attempt to relieve pain is motivated from two points of view. One is held by the physician, who is interested in determining the cause and the best measures for relief of the pain from which his patient is suffering; the other by the patient, who is not so much interested in the causal relation of pain to disease as he is desirous to be delivered from discomfort and distress.

This demand of the patient constantly urges the physician to apply means a measures for the alleviation of pain, that he may, driven to precipitate thera prescribe drugs and other remedies fo

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Submitted for publication Oct. 20, 1952.

the immediate relief of pain without due consideration of the underlying pathologic processes that cause the pain.

Since in many cases pain may be a determining factor in diagnosis and treatment, a most careful analytic study of all symptoms associated with the pain should be made, and, in addition, a thorough study of the patient's history should be undertaken.

The physician must also remember that the value of pain as an indicator of disease depends upon the type and intensity of the stimuli and the integrity of the sensory receiving apparatus, the sensory conduction apparatus, the sensory perceiving apparatus, and above all the ability of the physician to place correct interpretations on the data presented to him. Disorders in any of the aforementioned components disorganize the accuracy of the entire pain concept, which is also modified by the receptivity of the patient to irritative stimuli. This factor may be influenced especially by psychic states resulting from emotional tensions, which may render the patient more susceptible to pain-producing stimuli or may, on the contrary, erect a barrier between the reception of sensory stimuli and their conscious preception.

The medical attendant may also be puzzled not only by the phenomena associated with pain but, in many instances, by the question whether the pain complained of really exists. This doubt is especially likely to be a factor in the evaluation of pain in compensation cases, in which the pain follows an injury.

Diagnostic Significance Of Pain.—When the surgeon has become convinced that pain is actually present, then it is necessary for him to inquire why it is present, whence it originates, and what it indicates. After he has answered these questions, the next and most important is, How is the pain to be relieved? This problem proves very difficult unless the surgeon is able to make a proper investigation of the detailed processes concerned with the origin of the pain, and has not formulated his diagnosis, as to origin and significance, entirely on a topographic basis of the apparent characteristics of the pain.

In order to facilitate his efforts toward diagnosis he should be familiar with the principal pain complexes or syndromes, which may be divided into pain syndromes of the cerebrospinal system and pain syndromes of the sympathetic nervous system.

The first of these concerns *the direct role of the sensory activities of the cerebrospinal system in the production of pain.* The mechanism involved is relatively simple.

The irritation is received by the peripheral pain receptor, and a pain-producing impulse is aroused. This is transmitted by pain-conducting nerve fibers to (1) a nerve trunk, (2) a nerve plexus, (3) the spinal nerve, (4) the dorsal root (ganglion) and (5) the posterior horn of the spinal cord, where a synapsis occurs with an intersegmental neuron which ascends in the spinal cord for a few segments and then passes across the cord and ascends in the spinothalamic tract of that side through the medulla to the thalamus, where the fibers carrying the impulses producing the sensation of pain terminate; even at this stage the mind, i.e., consciousness, does not as yet recognize the sensation as painful.

But in the thalamus the pain-carrying nerve fiber synapsizes with a neuron, the axon of which carries the pain-producing impulse to the postcentral cerebral convolution, where cortical cells aided by additional informative impulses carried by association tracts, from memory centers in the frontal and upper temporal lobes of the brain, formulate a sensory pattern which, if it conforms to a similar one that memory recalls as belonging to pain sensation, gives rise to a conception that consciousness labels as pain. At this time the sensation is born—how, why or through what agencies we do not know. *That belongs to the mystery of pain.*

In the cortex a synaptic connection may

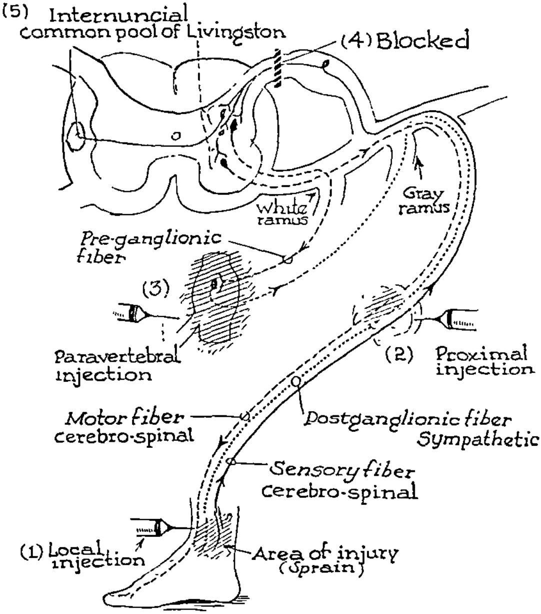

Fig. 1.—Role of sensory activities of cerebrospinal system in production of pain. *1*, local injection of anesthetic solution; *2*, proximal injection of anesthetic solution blocks pain reflex; *3*, paravertebral injection blocks reflex; *4*, resection of posterior roots (spinal anesthesia) or alcohol injection (Dogliotti's method) may relieve the pain; *5*, internuncial common pool of Livingston.

be made with a motor neuron of the precentral convolution through which consciously controlled motor impulses are created, are carried to the periphery and arouse reactions of defense, or, if that is not feasible, induce withdrawal (usually precipitate) from the source of the irritation.

Syndrome Due to Synaptic Transference in the Cord.—In some instances the pain impulse may never ascend in the cord as far as the brain, but may be short-circuited in the same segment of the spinal cord into which it entered and be transmitted by synaptic connection with an intermediate neuron to a ganglion cell in the ventral horn of the spinal cord, where a motor impulse is originated. This impulse is carried through the ventral root to a spinal nerve, the nerve plexus, the nerve trunks and peripheral nerves to the particular associated muscles that induce involuntary contraction of the affected muscles (the so-called defensive reaction). This reaction may occur in the somatic muscles of the head, neck, abdomen, back or extremities, or a reflex withdrawal of the irritated area from the source of the pain may be induced. The reflex withdrawal is automatic and occurs even before the pain impulse reaches the sensory perceptive centers in the brain (Fig. 1).

Pain may be related to a *somatic sympathetic syndrome* that results from synaptic transference of the pain impulse in the gray matter of the spinal cord to the neuron of a sympathetic nerve. The impulse then passes from the ventral horn of the spinal cord through the ventral root to a white ramus, and thence, as a preganglionic nerve fiber, to a paravertebral sympathetic ganglion where a synapsis is made with ganglion cells, the axon of which is carried as a postganglionic fiber through the gray ramus to a spinal nerve and is distributed to the peripheral somatic tissues, where impulses carried by it act on the blood vessels, the sweat glands and involuntary muscles, percepting the structural cells of the peripheral tissues and causing metabolic and other disturbances with the production of pain (Fig. 1).

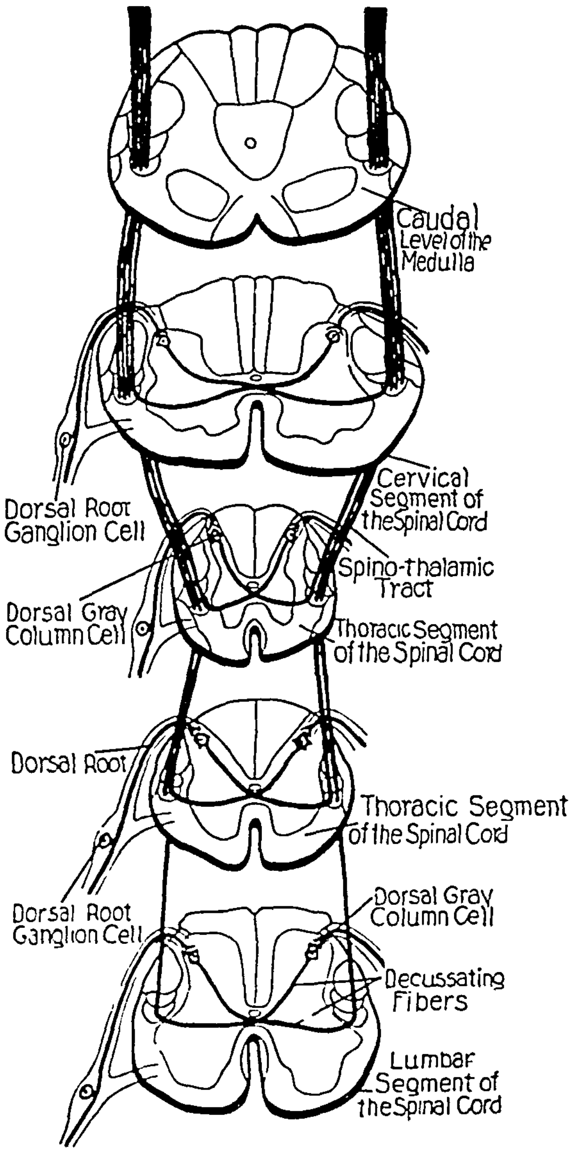
Caudal Level of the Medulla
Dorsal Root Ganglion Cell
Cervical Segment of the Spinal Cord
Spino-thalamic Tract
Dorsal Gray Column Cell
Thoracic Segment of the Spinal Cord
Dorsal Root
Thoracic Segment of the Spinal Cord
Dorsal Root Ganglion Cell
Dorsal Gray Column Cell
Decussating Fibers
Lumbar Segment of the Spinal Cord

Fig. 2.—Spinothalamic tract[*] passing through the spinal cord and representing the spinal division of the spinothalamocortical pathway. This tract serves to conduct impulses of affective sensibility, pain, discomfort and temperature. It is called the spinal fillet because it undergoes complete decussation in the spinal cord.

Pain is associated with the *autonomic nervous system reflexes or syndromes.*

In addition to the cerebrospinal system as a source of disquieting pain, the autonomic nervous system (consisting of the sympathetic parasympathetic nervous systems) is involved in pain production in both the somatic superficial and deeper tissues and the viscera. Irritation occurring in these various subdivisions gives rise to various groups of symptoms or pain syndromes.

When the primary irritation affects afferent sympathetic fibers in somatic tissues, the impulse is transmitted from its place of origin in a manner similar to the impulse from a cerebrospinal nerve fiber, except that in this instance impulse is carried by a sympathetic nerve fiber (Neuron I) which, in association with sensory cerebrospinal nerve fibers, is carried through the posterior nerve root to the posterior horn of the cord, where it forms a synapsis with an intermediate neuron, the so-called internuncial neuron. Extending between this point and a ganglion nerve cell, whose axon, it passes as a preganglionic fiber (Neuron II) through the ventral horn to a spinal nerve, and then passes through the white ramus to a paravertebral ganglion, where it forms a synapsis with a ganglion cell from which a postganglionic axon (Neuron III), passes through a gray ramus to a spinal nerve, by which it is carried to its peripheral distribution and terminates in a blood vessel, sweat gland or the arectores pilorum muscles. Impulses also cause disturbances of peripheral tissue that produce irritative substances stimulating the nerve endings of pain-sensory somatic cerebrospinal nerve fibers and may give origin to the extremely disabling painful reflex termed *causalgia.*

---

[*] From Tilney and Riley, The Form and Functions of the Central Nervous System. New York: Paul B. Hoeber, Inc., 1938. 3d ed. Fig. 210, p. 186. Illustration shown is only a part of Figure 210.

It has been demonstrated that *pain-producing impulses may be transmitted independently of the cerebrospinal nerves by sympathetic nerve fibers,* direct to the thalamus and the cerebral cortex, but it is more likely that the pain impulses from the sympathetic nerve fibers are transferred through synapses with cerebrospinal sensory nerve terminals of the posterior root fibers, and a true somatic sympathetic peripheral pain syndrome arises and is due to the network of sympathetic nerve fibers located in the peripheral tissues of the affected region.

Local Sympathetic Pain Syndrome From Local Injury.—The aforedescribed manner of network distribution explains pain production and the distribution of aching, nagging pain, indefinitely distributed over the shoulder or the back or down the arm, that follows chilling or injury of the shoulder, the upper part of the arm, the neck or the back. In the affected region there usually is one spot or area (the so-called pressure point) where pressure causes both a severe local pain and a reduplication of the referred pain in surrounding and even distant areas. The pressure point usually remains stable, but the areas of pain radiation vary constantly in location and intensity. This type of pain is regarded as due to impulses carried by interweaving sympathetic nerve fibers to the tissues, where they stimulate metabolic disturbances in which the products of disordered metabolites cause irritation to the terminals of sensory nerves that carry pain.

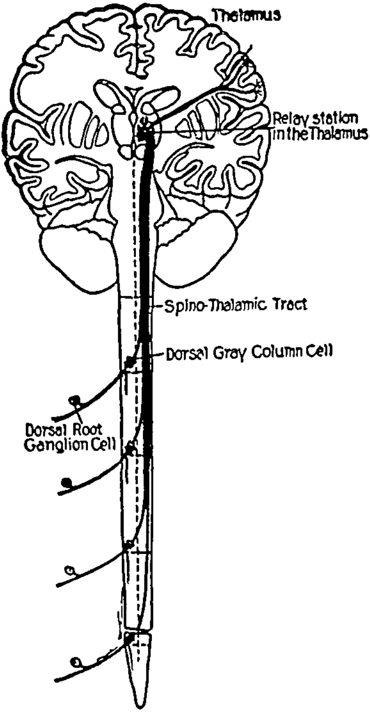

Fig. 3.—Spinothalamic tract* passing through spinal cord and representing spinal division of spinothalamocortical pathway. This tract serves to conduct impulses of affective sensibility, pain, *discomfort and temperature. It is called the* spinal fillet because it undergoes complete decussation in the spinal cord.

Pain Syndrome Related To the Viscera.—The consideration of pain in the viscera leads directly to the question, almost as old as physiology itself, whether the nerve supply to the viscera contains a sensory pain component. Under normal circumstances and states in which the viscera are healthy, the subject is not conscious of the activities of his internal organs, and this is fortunate; otherwise he would

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*From Tilney and Riley, *The Form and Functions of the Central Nervous System.* New York: Paul B. Hoeber, Inc., 1938. 3d ed. Fig. 210, p. 186. Partial reproduction.

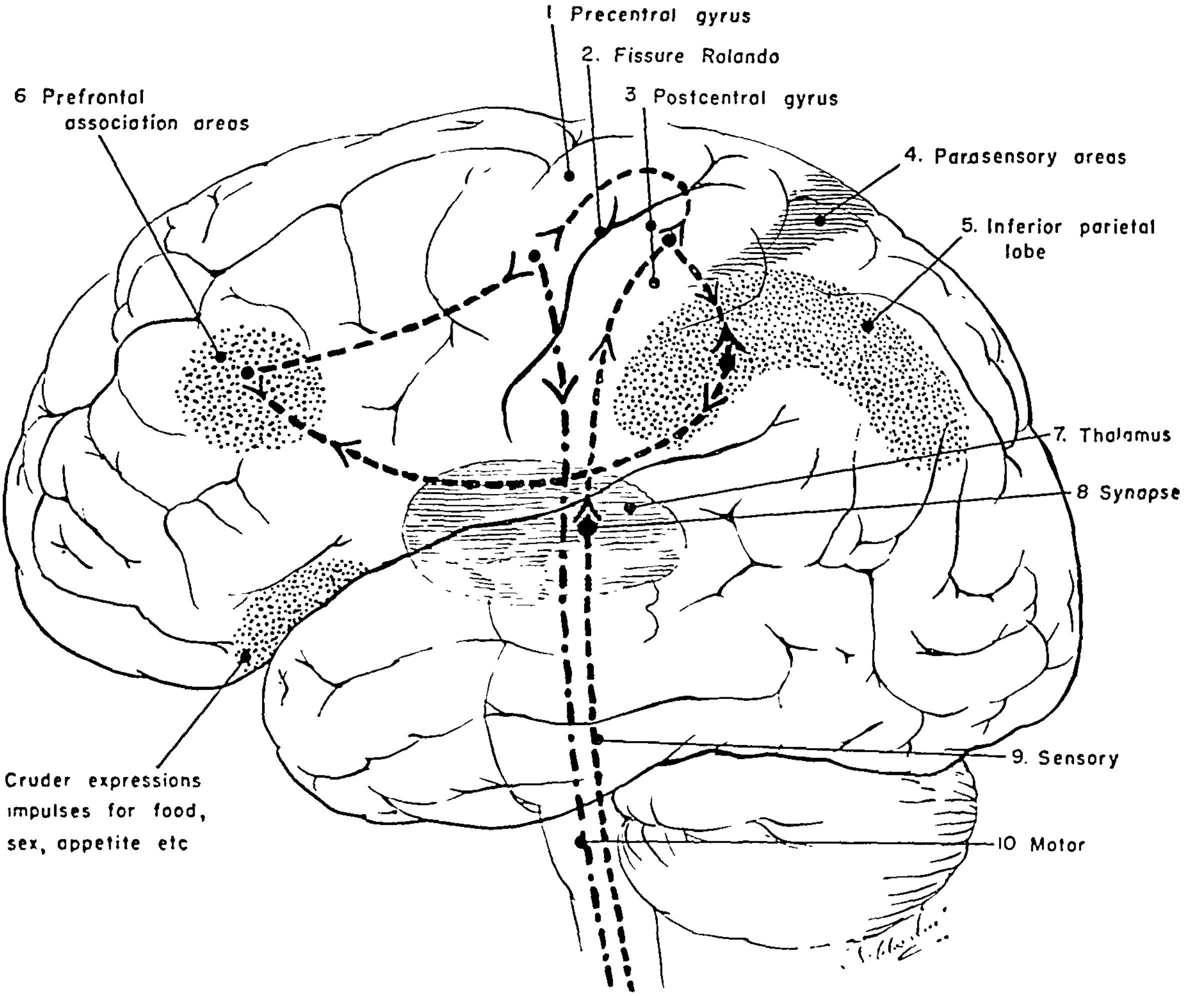

Fig. 4.—Association pathways in cerebrum, indicating reflexes contigent upon a pain stimulus arising in periphery. In man the primary location of most of the higher cortical functions is in one hemisphere.

be in constant turmoil. It is also well that vital activities are regulated by affectors and that the controls are in the central nervous system and beyond the control of the subject. These vital centers harmonize the processes of normal existence, but in the presence of disease different conditions arise. It then becomes necessary for the organism to become aware of and resistant to disturbances inimical to its well-being. For a long time, because of this subconscious activity and nonapparent sensory expressions, it was thought that the viscera had no perceptive sensation, but it is now generally agreed that even under normal conditions there arises from sensory impressions in the viscera a central perceptive feeling of well-being or satiety, and that pathologic disturbances give rise to an unwell feeling without any definite peripheral anatomic localization. The indefinite localization should be expected, for a person who does not know exactly where his gallbladder, or his stomach, or any other of his organs is located cannot possibly localize pain due to disease of the gallbladder, the liver, or any other viscus, in the affected organ. The question also arises, does the sensation of pain actually arise in these organs, or is pain due to the viscerosomatic reflex from impulses referred from the source of irritation in the viscera to the cord and thence to the abdominal wall, where referred pain is incited? As yet the riddle is not completely solved, even though the manner in which visceral pain sensation is produced has been under investigation for a long time. Study and research on this problem is rendered more difficult because the painful sensation associated with visceral disease is not of the same type as that which is caused by irritation in the external or surface tissues, but is more closely related to a central psychic reaction and a feeling of discomfort and distress.

This lack of central discrimination is natural and understandable, since the patient as a rule has never learned through central selection to associate the visceral sensory impulses with any definite pattern of pain or sensation. He is unable to locate the origin of the distress because of the absence of other perceptive factors, such as pain, touch, pressure and other sensations which have been developed through endless generations between the central perceptions and sensory impressions from the external superficial tissues. As a consequence, the disquieting sensation aroused at the perception center in the brain by nerve impulses (sympathetic) from visceral lesions cannot, in the absence of other qualifying sensations, be accurately classified. Naturally, therefore, these sensations frequently give rise only to an indefinite feeling of discomfort or a sense of being unwell.

Such sensations, according to their character and their site of origin, are referred rather indefinitely to the abdomen, the chest, or some area in the leg, arm or head. Examples of such referred sensations are the intensely disagreeable feeling in the chest induced by coronary disease; or the abdominal distress associated with tympanites, or the burning, aching abdominal pain that accompanies severe intestinal spasm, diarrhea, dysentery, etc.

It is also significant that the sensations which arise from the irritation of sympathetic nerve terminals in the viscera and which definitely do come into consciousness are always perceived as a feeling of discomfort or of pain. This means that as long as the visceral organs are performing their functions properly the subject does not know that he possesses such organs, but as soon as disturbances arise they produce discomfort and pain, and the subject's attention is directed to the presumable source.

It is also possible for peripheral somatic stimuli to be carried to the spinal cord and, by synaptic contact, to arouse reflex activities in the viscera, with sympathetic ganglion cells in the cord to arouse reflex activities in the viscera. The practical effect is evidenced by many instances in which folk medicine is applied—especially the application of irritating stupes or hot compresses to the abdomen to relieve tympany or other painful lesions and spasms of the viscera.

Pain Syndrome Arising In The Peripheral Sympathetic Network.—It is difficult to understand how pain impulses are created in the peripheral sympathetic nervous system, which seemingly does not have any peripheral terminal receptors. The nerve fibers apparently end in a plasmodium network in which the component fibers are fused with each other. In this plasmodium there are no definable terminations. However, irritation to these fibers does arouse impulses, which are transmitted widely in all directions and are thought to cause pain by secondary effects which they produce in the affected tissues. These secondary reactions involve involuntary muscle fibers, blood vessels, the blood supply to nerves, glandular organs, etc. The pain thus incited does not remain constant in the same area, and it varies in intensity even though the exciting factors do not change in character or in intensity. Usually, however, there is one particular area, called a *trigger point*, which is very sensitive to pressure and which, when pressed upon, arouses both local pain and pain radiating into the areas in which it was previously most intense.

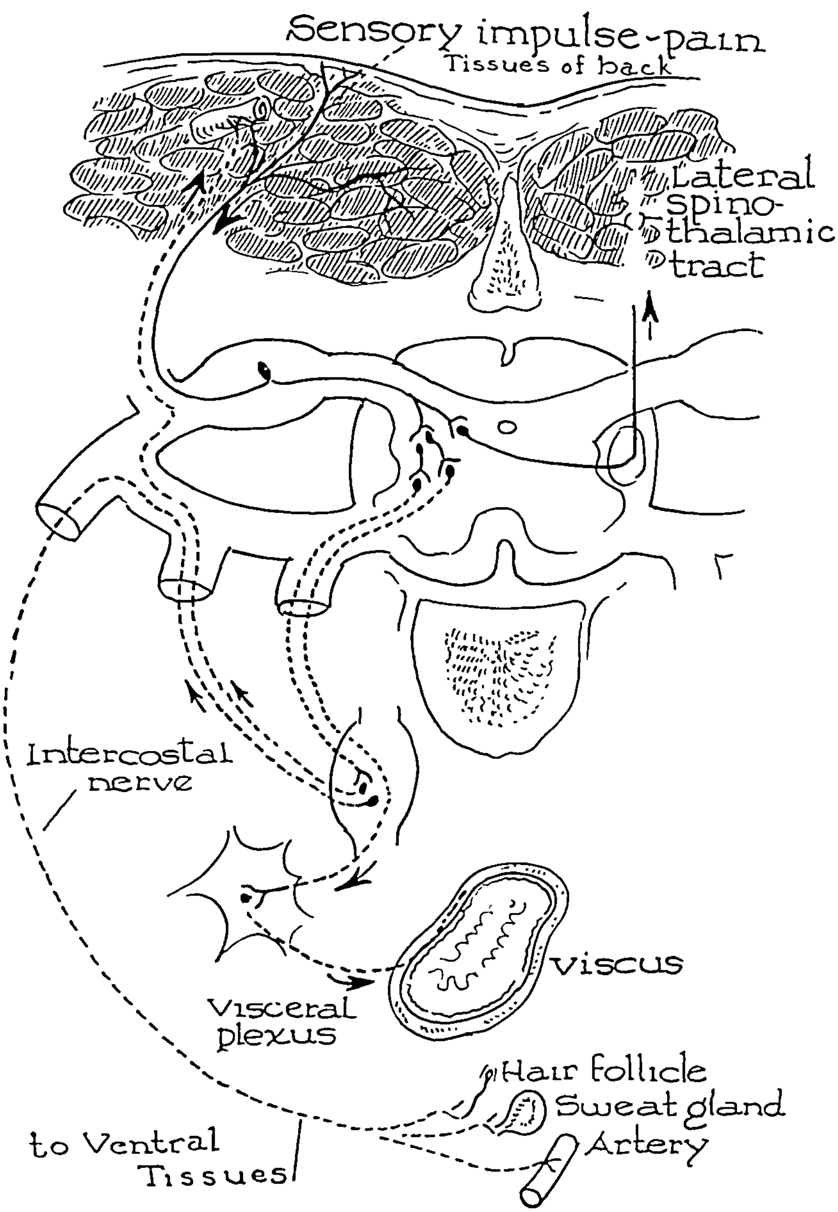

Fig. 5.—Reflex from skin to viscus and back to mural tissues, with irritative stimulation of hyperemia, metabolic activities, etc. indirectly productive of pain. Note afferent sympathetic nerve fiber passing through paravertebral ganglion without synapsing, the synapsis being in the celiac or visceral plexus.

Viscero-Visceral Pain Syndrome. — Interviscerovisceral pain reflexes exist by which the visceral reactions, owing to stimuli arising in one viscus, are transferred to another by intervisceral sympathetic nerve connections, giving rise to functional activity, particularly in the organ secondarily involved. For example, pathologic changes in the appendix and its mesoappendix may arouse terminal sensory impulses, which are carried through the associated mesenteric and celiac plexus and the paravertebral ganglia to the spinal cord and there through synaptic connecion create an impulse which is referred through sympathetic nerve fibers to the pylorus of the stomach or the sphincter of the gallbladder (the sphincter of Oddi), where it causes spasmodic contraction. This spasmodic contraction causes pressure or traction on terminal sensory nerve filaments supplied to these structures, with the production of pain. This reaction is called *dyskinesia*. From both the primarily and the secondarily affected organs, the pain impulses are transmitted through splanchnic nerve fibers to the paravertebral ganglia and thence to the spinal cord, where dermatomic reactions originate and give rise to segmental dermatomic hyperalgesia. This is associated with zones of both the primarily and the secondarily involved organs. In cases of dyskinesia, therefore, there may be two segmental hyperalgesic zones or areas of maximum tenderness, one associated with the organ primarily involved and the other with the organ secondarily involved.

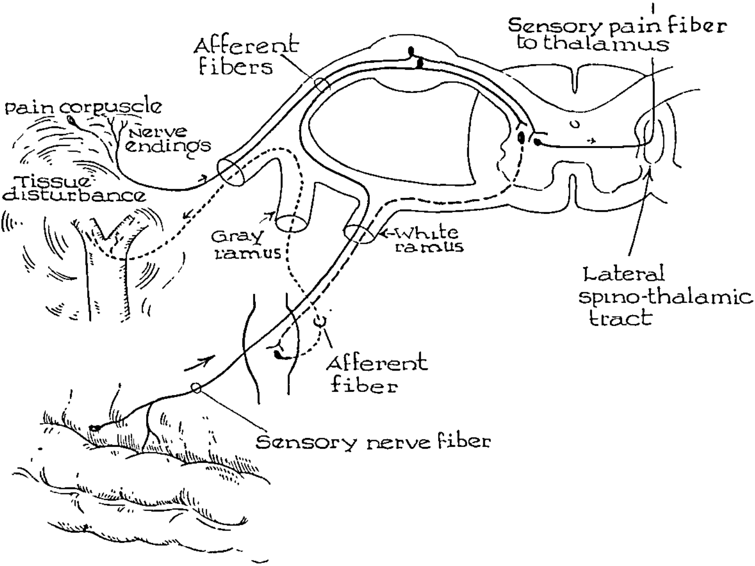

Fig. 6.—Hypothetical course of a sensory impulse from the viscera through sympathetic ganglion to white ramus, posterior root, posterior horn. The sympathetic central cell in the cord and its axon to the sympathetic ganglion (paravertebral) then synapses with a sympathetic nerve cell whose axon passes through the gray ramus to the spinal nerve and is distributed to the blood vessels, sweat glands, involuntary muscles, etc., of the somatic structures, where the sensory nerves are irritated and become sensitive, by metabolites which are liberated in the hyperesthetic area, irritate the sensory nerve endings and set up states of irritability and pain through afferent cerebrospinal nerve fibers (David and Pollock, 1932, 1935; Doupe, 1943; Lewis, 1936; Morley, 1937) so that what would be normal irritations are interpreted as pain (Penfield, 1925; Travel, Barry, Bigelow, 1944). The transmission of efferent impulses from the anterior horn to the somatic voluntary muscles causing segmental or total contraction is not shown.

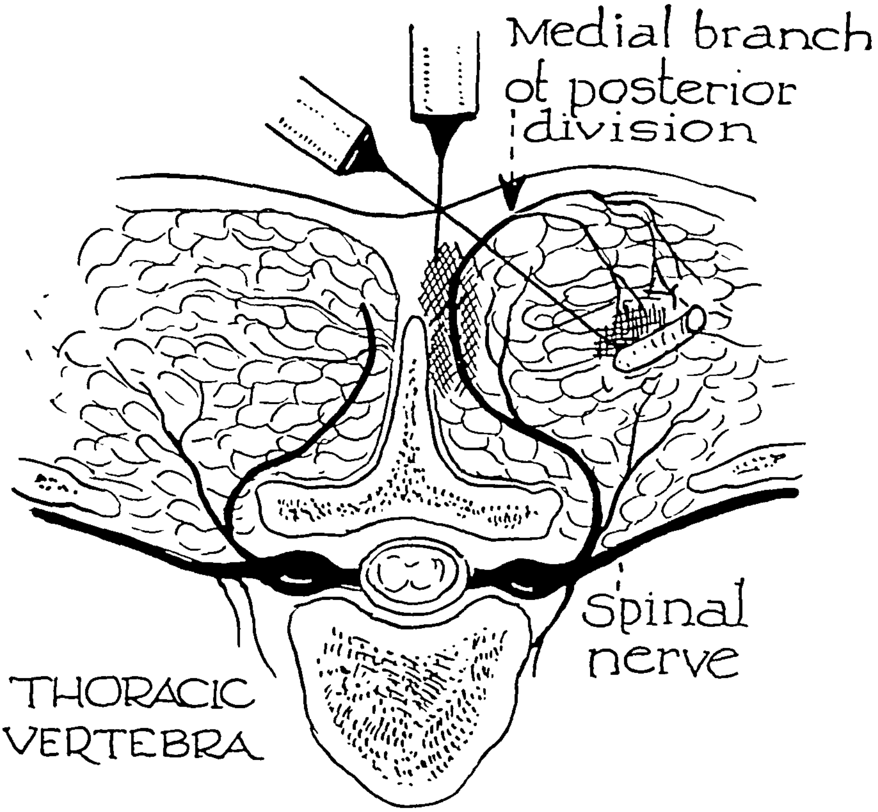

Fig. 7.—Diagram of transverse section through a thoracic vertebra (adapted from Spalteholz). If the technic of Lewis and Kellgren is followed, the portion of the medial branch of the posterior primary division of the spinal nerve lying within the cross-hatched area is liable to be directly affected by the injected saline solution. If the needle, in a medium-sized patient is inserted to a depth of about 4 cm. it will make contact with the transverse process. If it is now pushed forward above 1 cm. it will pass the transverse process of the vertebra. This is indicated by the patient's calling that the pain is going around the abdomen or into the groin of the leg. This is the point of election for the injection.

Modified from Sinclair, Feindel, Weddell, and Falconer, The Intervertebral Ligaments As A Source of Segmental Pain, J. Bone & Joint Surg. (British number) 30-B: 515 (Aug.) 1948.

Syndrome of Double Reference.—The presence of referred pain in two or more different peripheral zones or areas causes confusion in diagnosis. At times the surgeon is puzzled by pain located in an area to which it is referred from different organs. For example, pain occurring in the right lower quadrant of the abdomen may be referred pain from lesions of the ovary or of the appendix (the eleventh dermatomic zone for the appendix and the tenth zone for the ovary). The boundaries of these two areas sometimes overlap to such an extent that pain due to lesions of the ovary may be confused with that due to the lesion of the appendix, and vice versa. However, in the presence of either of these two conditions other signs and symptoms are present to aid in diagnosis. If the patient has appendicitis there are nausea, vomiting, at least a slight increase in the leukocyte count, usually fever, constipation, and rigid and tender abdominal muscles in the lower right abdominal

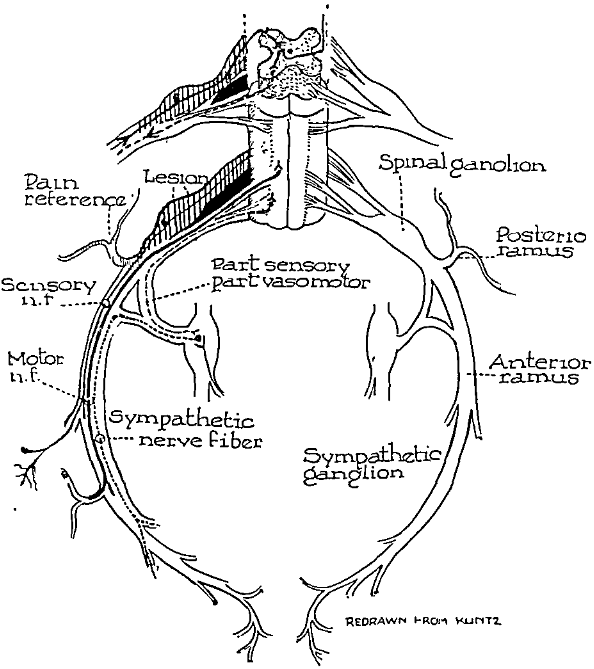

Fig. 8.—Diagrammatic representation of two segments of the spinal cord, [illegible] ve roots and spinal nerves (Papez' [illegible] owell Co. Fig. 109. Redrawn from [illegible] Lea and Febiger, 1945, p. 121.

quadrant. Ovarian pain areas are, as a rule, due to disturbances of ovulation. A thickened ovarian capsule may hinder ovulation, with swelling of the ovarian parenchyma and pressure on the capsule. This type of pain usually occurs during the midmenstrual period, at the time of rupture of the graafian follicle. The pain may alternate from side to side apparently depending on which ovary is ovulating at the time.

These are the most important of the pain syndromes useful to the surgeon who is well aware of the *diagnostic significance of pain.* In his endeavor to make a correct diagnosis the surgeon, when he encounters pain, should endeavor to determine whether the pain-productive factors may be classified as (1) cerebrospinal or (2) autonomic (sympathetic or parasympathetic).

In his consideration of pain, the medical attendant should always remember that *pain is a symptom and not a dis* that in every case in which pain is presented it is necessary to determine, if possible, the character of the disturbances causing the pain. Treating the pain alone may lead to distressing mistakes. However, if the pain is excruciating and severe, one should not spend excessive time in attempting to arrive at an exact knowledge of the causative factors. The demands of the patient for relief should be heeded, and later, under more appropriate circumstances, a detailed search may be made for the inciting lesion.

At the same time, the psychic reaction of the individual patient to painful disturbances should be determined, so that an evaluation may be made of the actual intensity of the pain, in terms of the ability of the patient to sustain varying degrees of physical discomfort without complaint. In this manner there is erected a crude standard for rating the severity of a pain as applied to any particular person. In this connection it must be remembered that pain may be an expression of frustration and that the patient may not desire to be relieved, because he cherishes the pain as a means of exciting sympathy or as an excuse for release from annoyance, work or responsibility.

The wise physician, as he sits in judgment upon a particular pain problem, is aware of the difficulties of making a correct diagnosis from the numerous and sometimes conflicting data presented to him. If he regards his responsibility worthily he will advise operative or other procedures only after a careful discriminative study of the symptoms and exclusion, if possible, of all but the suspected

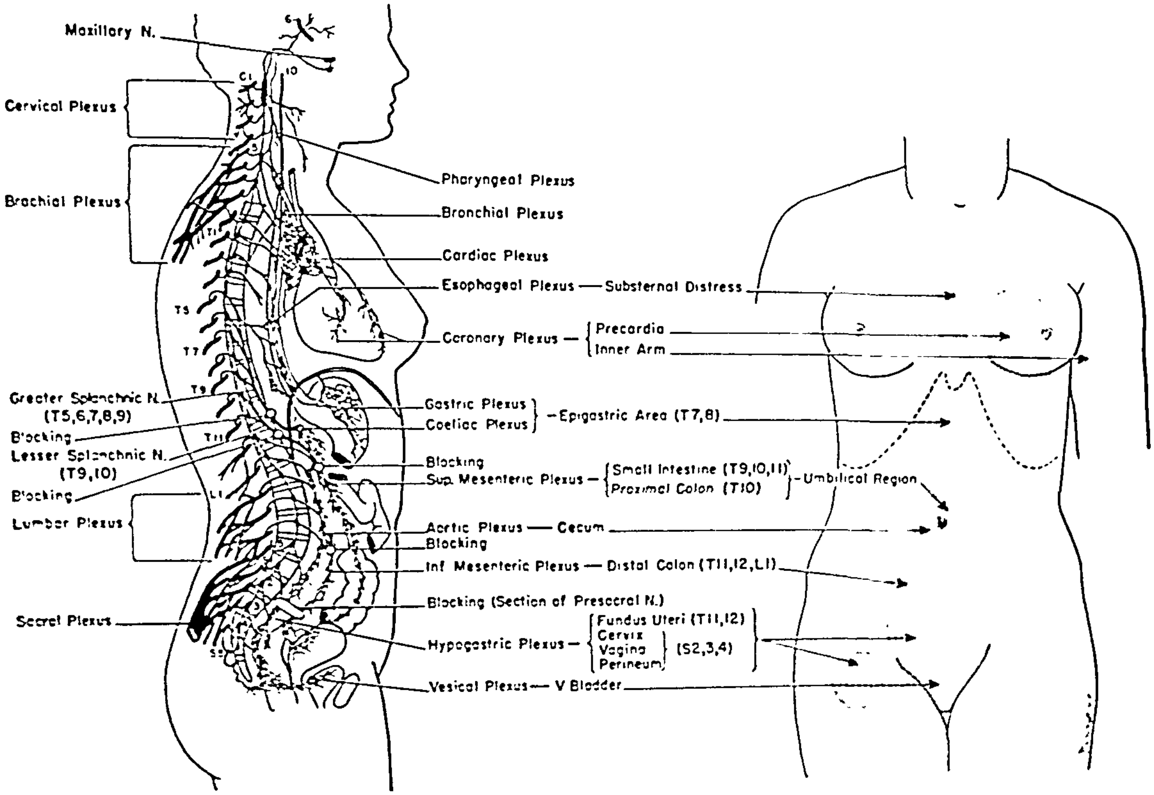
Maxillary N.
Cervical Plexus
Brachial Plexus
Greater Splanchnic N. (T5,6,7,8,9)
Blocking
Lesser Splanchnic N. (T9,10)
Blocking
Lumbar Plexus
Sacral Plexus
C1
10
T1
T5
T7
T9
T11
L1
S5
Pharyngeal Plexus
Bronchial Plexus
Cardiac Plexus
Esophageal Plexus — Substernal Distress
Coronary Plexus — Precordia, Inner Arm
Gastric Plexus, Coeliac Plexus — Epigastric Area (T7,8)
Blocking
Sup. Mesenteric Plexus — Small Intestine (T9,10,11), Proximal Colon (T10) — Umbilical Region
Aortic Plexus — Cecum
Blocking
Inf Mesenteric Plexus — Distal Colon (T11,12,L1)
Blocking (Section of Presacral N.)
Hypogastric Plexus — Fundus Uteri (T11,12), Cervix, Vagina, Perineum (S2,3,4)
Vesical Plexus — V Bladder

Fig. 9.—Diagram illustrating the general distribution of the autonomic nervous system and the connections of the right sympathetic trunk with the thoracic, abdominal, and pelvic plexuses. (Modified and redrawn from Kuntz, A.; The Autonomic Nervous System, Philadelphia: Lea and Febiger, 1945, Fig. 240, p. 310. This figure was after Gray's Anatomy, after Schwalbe.)

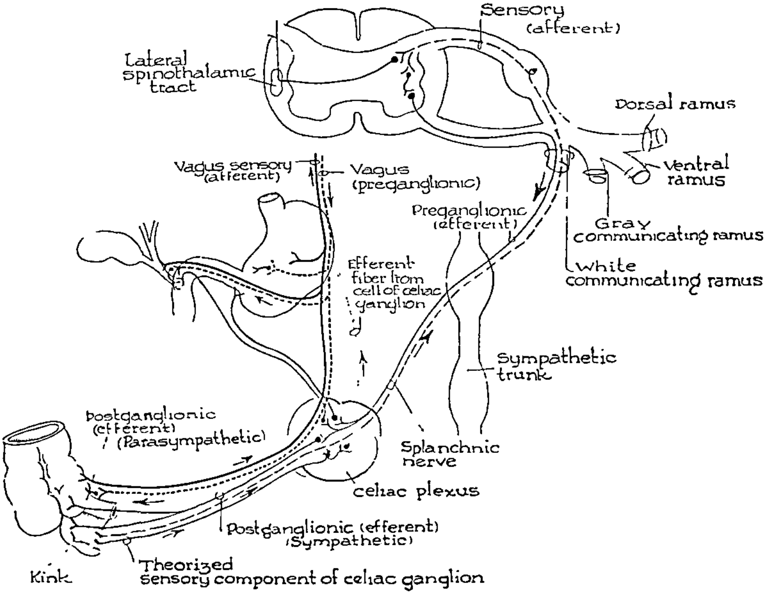

Fig. 10.—Process by which the impulse is carried from the appendix through the superior mesenteric plexus to the (celiac plexus to the greater splanchnic) to the paravertebral ganglion or direct to the paravertebral ganglion to the gray ramus to the posterior horns of the cords in the gray matter of which it synapses with vasomotor cells or with motor cells. From these preganglionic fibers are given off and are carried to the paravertebral ganglia, where synapsis takes place with a cell of a postganglionic neuron which is distributed to the pyloric sphincter, the biliary sphincter and the sphincter of Oddi.

lesion. In this consideration, the possible benefits of operation are to be carefully balanced against any harmful effects that may result from operative intervention.

Diagnostic criteria as presented to the surgeon for the appraisal of pain in his diagnostic evaluation, as well as the history of the patient immediately prior to his coming under observation, are of great value. If the pain is in the abdomen and there has been a history of pain followed by fever, the lesion is inflammatory. If there has been pain and no fever, some type of colic, twist or obstruction is present. Urgent surgical intervention is not necessary in the latter instance, unless other symptoms, such as vomiting, occur. If vomiting is continuous and without nausea, obstruction of the bowel should be considered. Vomiting without nausea indicates a reflex lesion, that is, a lesion at a distance is causing it. Vomiting with nausea indicates either a local gastric lesion (gastric carcinoma, gastric ulcer, gastric dilatation) or a central psychic one (nausea from the sight or smell, etc., disagreeable objects). Vomiting may associated with any abdo

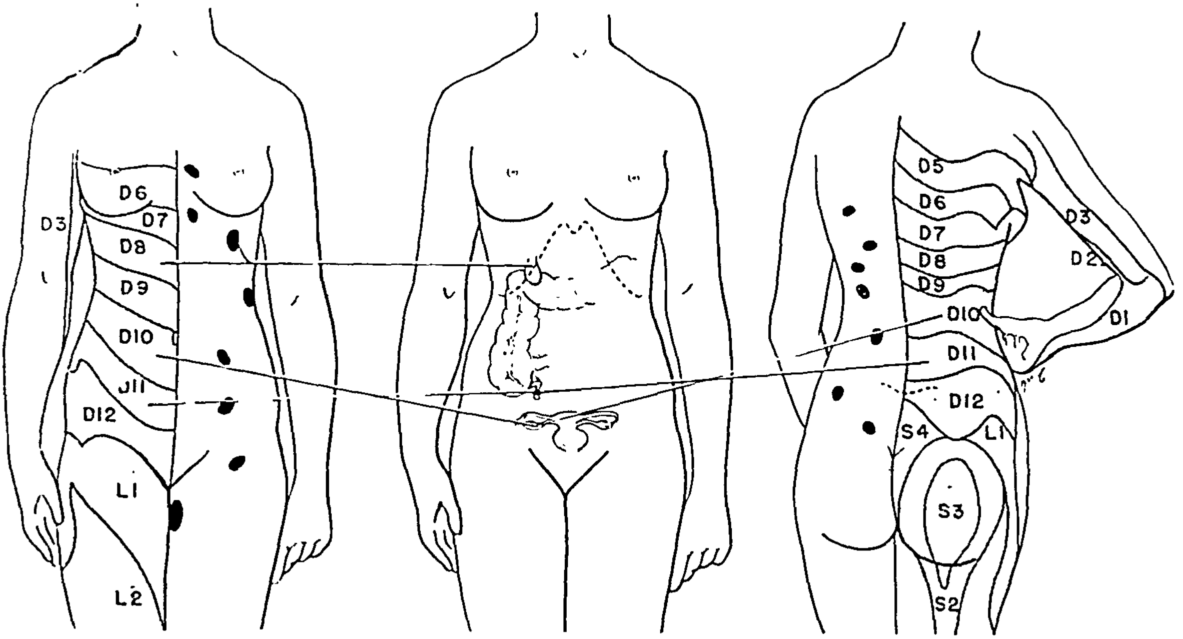

Fig. 11.—Manner in which pain from the ovary is referred to the tenth thoracic zone and pain from the appendix is referred to the eleventh thoracic zone. These are in close apposition, and pain reference from one may be confused with pain reference from the other.

lesion severe enough to cause pain. Such vomiting usually occurs synchronously with the pain and as a rule is not repeated. However, if a primary pain is accompanied by vomiting which ceases, and secondary vomiting without pain occurs later, it is a sign that a serious lesion of the gastrointestinal tract is present. The location of the lesion is indicated by the type of pain and the area in which it is felt. It must be emphasized that abdominal pain is not necessarily located over the pathologic area, except, of course, when the parietal peritoneum is involved, localizing pain and tenderness to the diseased area.

Pain in association with persistent constipation and vomiting indicates a lesion of the intestine. The greater the pain and the more persistent the constipation, the more severe is the lesion. It is unnecessary to remind surgeons that the most likely source of pain combined with obstinate constipation is intestinal obstruction, due to volvulus, intussusception, ileus, inflammatory or mesenteric thrombosis, or cancer of the bowel.

In the urgency for alleviation and the haste induced by the desire to relieve excruciating and uncontrollable pain, the physician or surgeon should not be stampeded into the application of measures or the use of remedies which in his calmer judgment he would know were unjustified. He should not forget that the first requirement of the physician's code is never to do anything or use any method or means of treatment the harm of which outweighs the benefit. Nothing should be undertaken, except under great urgency and after mature deliberation, which is dangerous to life or will leave such a serious functional or anatomic defect that the cure can be regarded as worse than the disease (Leriche,* p. 66).

With the foregoing reservations, therefore, the treatment of pain may be considered under (a) removal of the causative pathologic tissues and (b) simultaneous introduction of measures for control of the pain by:

1. Blocking of the affected pain recep-

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*Leriche, R.: The Surgery of Pain. Baltimore: The Williams and Wilkins Company, 1939.

tors (a.) by local application (cold, anesthetic ointment, etc.) or (b.) by injection of an anesthetizing solution into the painful area.

2. Blocking of the pain impulses from the affected area by injection of an anesthetizing solution into or around the afferent nerve fibers carrying the pain impulses.

3. Blocking or section (rhizotomy) of the posterior root or the associated sympathetic ganglia, if the pain is of sympathetic

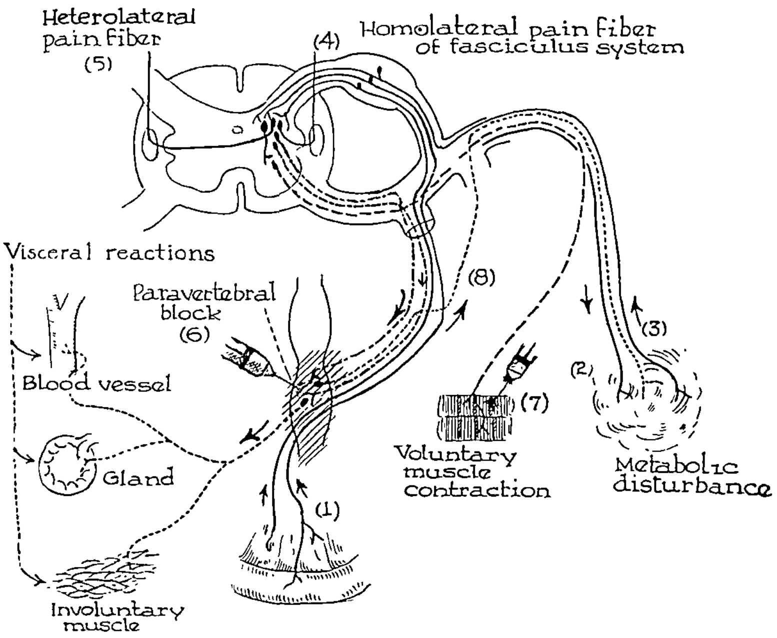

Fig. 12.—The drawing shows diagrammatically how impulses arise in the viscera and are transmitted to somatic areas: *1*, they may be referred through the paravertebral ganglion to *2*, the somatic areas of the body, where they cause metabolic changes causing irritation to sensory pain fibers *3*, and imitate pain impulses in cerebrospinal somatic pain fibers which are transmitted to the cord, where after synapsing they are *4*, transmitted to a higher segmental homolateral level by ascending homolateral fibers and give localization to pain on a higher level on the same side or on the opposite side. It is possible that transference may also occur by descending fibers to a lower segmental level or after synapsing the fibers pass across the cord by *5*, homolateral intersegmental fibers which ascend upward one or two segments and then are transferred to the spinothalamic tract of the heterolateral side *6*, therapy: blocking of ganglion with anesthetic solution (paravertebral block) inhibits all transmission (Kappis and Gerlach, 1913; Kulenkamff (splanchnics anesthesia) 1923). *7*, injection of anesthetic solution in striped voluntary muscle to relax contraction and prevent [illegible]; contraction when impulses are reflexly transmitted from mesenteric irritation (Lew[illegible]en). *8*, fibers carried to somatic tissues, where metabolic disturbances are aroused. [illegible] producing impulses in the sensory somatic nerve fibers distributed in this area.

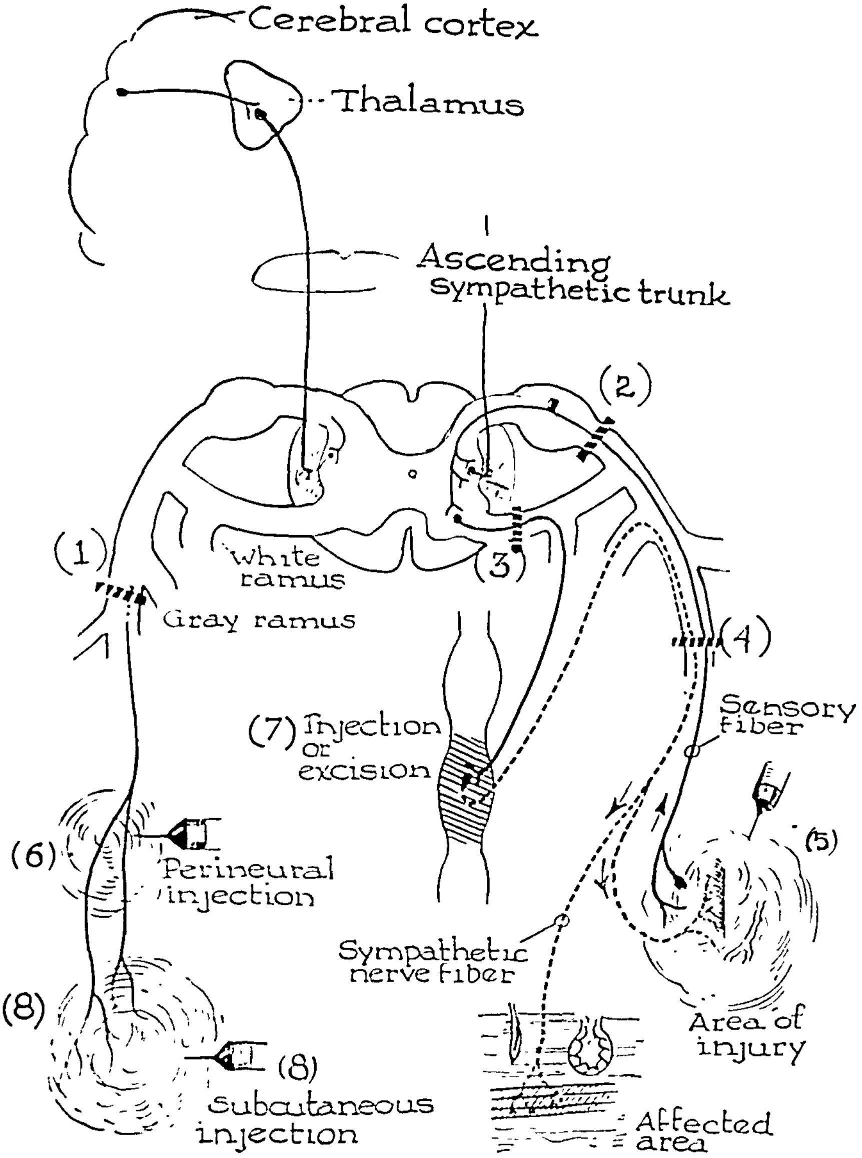

Fig. 13.—*1*, section of both roots caused loss of all sensation from the affected parts (deep pressure, also absence of sweat glands, vasomotor and pilomotor activities). *2*, posterior root section also not entirely effective. *3*, section fairly successful. *4*, section of afferent nerves from affected area will not completely abolish sympathetic nerve reactions and pain, owing to the diffuse manner of its central conveyance. *5*, injection of anesthetizing substances primarily successful. *6*, perineural injection of anesthetizing solution is of some benefit. *7*, injection or excision. *8*, subctuaneous injection of local anesthetic causes loss of pain sensation but retention of deep pressure, sweat secretory, pilomotor, and vasomotor activities. Deeper and more diffused injection will abolish these activities.

nerve origin.

4. Control of the referred pain and hyperalgesia to segmental dermatomic zones by desensitization of these areas through subdermal injection of anesthetic agents.

5. Blocking of peripheral nerves in the presence of somatic referred pain.

6. Section of the spinothalamic tract

in the cord.

7. Dulling of perception by narcotization of the central areas in the brain with central narcotics, anesthesia and hypnotism.

8. Lobotomy; section of the cerebral association tracts for intractable pain.

Precautions To Be Used In Major Operative Treatment Of Pain.—The surgeon must be very sure of his diagnosis before he enters upon an extensive operation for the control of pain, for an operation based upon a wrong diagnosis may entail upon a patient an irreparable disaster. Instead of one disease he may be afflicted with two, the one from which he originally suffered and another produced by the surgeon. The second may be worse than the first. For this reason, in deciding on surgical intervention for the relief of pain, the surgeon should carefully review all factors before he takes operative action. He should consider the presenting symptoms carefully, logically, and in detail, evaluating the benefits of the operation against the disturbances and complications that may be produced by it, and should estimate the character and mental status of the patient. It is without question most advantageous for the surgeon if he is capable of making his own decisions and is not forced to rely blindly upon the conclusions of any colleague, irrespective of his prominence.

Because pain of itself is not dangerous to life and has only an evanescent effect on function, interventions that may end in basically harmful effects or in serious disability or incapacity should not be lightly undertaken for its relief. This applies especially to cordotomy, which the neurosurgeon is frequently and strongly urged by the patient and his medical attendants to perform.

In many instances the possibilities of the good and bad effects of operative intervention are not sufficiently and graphically reviewed and presented in an understandable form to the patient and his family. Particularly lamentable is the serious operation which has not been followed by relief of pain but, on the contrary, by the onset of inconveniences and disturbances not previously present, such as occur after cordotomy. This operation may completely relieve the pain for which it is performed, but it often leaves in its wake paralyzed vesical and rectal sphincters and other equally disturbing sequelas. *On the other hand, blocking operations on the sympathetic nerves,* although not completely successful in totally relieving the pain, *at least do very little harm* and may produce much good in controlling pain of sympathetic nerve origin, which is a type of pain especially tending to sap the moral and physical stamina of the patient and render him unable to bear even the slightest discomfort and distress. Through an undefinable influence, sympathetic ganglion blocking may also relieve pain associated with the craniospinal nerves. Next in order, if sympathectomy is without result, rhizotomy (section of the posterior roots of the involved spinal nerve) should be reviewed. If all other measures fail, prefrontal lobotomy should be considered. This operation, though it does not abolish the sensation called pain, does remove the pattern which the patient identifies as painful, so that, although the pain sensation may be present in a modified form, it is not identified as painful and is not particularly disturbing. Unfortunately, however, this procedure may cause great deterioration in the patient's social relations, sense of obligation, and functional acts and habits.

SUMMARY

The modes of transmission of pain are described in detail. Of the nature of pain there is admittedly much still unknown. The author describes numerous pain syndromes that have diagnostic value, especially to the surgeon who handles compensation cases. Strong emphasis is laid on the necessity for conscientious and thorough study and evaluation of the presenting symptoms before any neurosurgica operation is attempted, since with som of these procedures there is grave danger

of leaving the patient in a worse state than before. Assuming, however, that every possible precaution has been taken, the author lists his own recommendations as to the procedures of choice in dealing with various types of pain.

SUMARIO

Os modos de transmissão da dôr são descritos com todos os detalhes nêste trabalhe.

O autôr admite muitas causas sôbre a natureza do fenomêno dôr, até então desconhecidas. Descreve êle numerosas sindrômes dolorosas que têm sensivel valôr diagnostico, especialmente para o cirurgião que lida com tais casos, chamando a atenção de todos para uma correta apreciação dos sintômas apresentados,—o que faz com todo distaque,—antes que venha a sêr praticada qualquer intervenção de neuro-cirurgia, salientando que a falta de uma perfeita identificação exata des sintêmas podera acarretar um perigo maior para o doente depois que antes da intervenção praticada.

Realça as precauções que devem sêr tomadas, enumerando o autôr suas proprias recomendações quante a escôlha dos processos a sêrem executadas nos diferentes tipos de dôr.

RIASSUNTO

Vengono descritte dettagliatamente le vie di trasmissione del dolore. Sulla natura del dolore vi è ancora molto di oscuro. L'autore descrive varie sindromi dolorose che hanno valore diagnostico. Viene dato grande rilievo alla necessità di uno studio coscienzioso e completo e di una valutazione dei sintomi prima di eseguire qualsiasi intervento neurochirurgico, poichè con qualcuno di tali interventi vi è il grave rischio di peggiorare le condizioni del malato. Una volta presa ogni possibile precauzione, l'autore enumera i vari procedimenti di scelta nella cura di ogni tipo di dolore.

RESUMEN

Se describen en detalle los modos de transmisión del dolor. Acera de la naturaleza del dolor, se admite que se desconoce mucho aún. El autor describe numerosos síndromes dolorosos que tienen valor diagnóstico, especialmente para el cirujano que maneja casos compensados. Se hace notar fuertemente la necesidad de un estudio concienzudo y evaluación de los síntomas que se presentan, antes de cualquier operación neuroquirúrgica, ya que en algunas de estas, existe grave peligro de dejar al paciente en un estado peor al previo. Sin embargo, asumiéndose que han sido tomadas todas las precauciones posibles, el autor hace una lista de sus recomendaciones y procedimientos de elección tratándose de diversos tipos de dolor.

RÉSUMÈ

L'auteur décrit en détail la physiologie de la douleur. Il énumère aussi certaines douleurs dont les symptomes a de la valeur pour l'orthopédiste et le "traumatologue." L'auteur suggère des procédés pour soulager la douleur.

ZUSAMMENFASSUNG

Die verschiedenen Wege der Schmerzübertragung werden im einzelnen beschrieben. Es wird zugegeben, dass über das Wesen des Schmerzes noch vieles unbekannt ist. Der Verfasser beschreibt zahlreiche Schmerzsyndrome, die besonders für den Chirurgen der Entschädigungsfälle zu behandeln hat, von diagnostischen Wert sind. Es wird besondere Betonung auf die Notwendigkeit sorgfältiger und gewissenhafter Untersuchung und der Auswertung der vorliegenden Symptome vor dem Versuch eines chirurgischen Eingriffs am Nervensystem gelegt. Manche dieser Eingriffe tragen die Gefahr in sich, den Kranken in eine schlechtere Situation zu bringen als er vorher war. Für den Fall jedoch, dass

alle diese Vorsichtsmassnahmen getroffen sind, zählt der Verfasser eine Reihe seiner eigenen Ratschläge hinsichtlich der Auswahl der Verfahren auf, die zur Behandlung verschiedener Formen des Schmerzes dienen können.

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NINTH INTERNATIONAL CONGRESS, 1954

Under the Sponsorship of the Brazilian Government

Notice to All Members of the International College of Surgeons:

The House of Delegates on May 9, 1952, in Madrid, Spain, decided that the City of São Paulo would be the meeting place of the next International Congress, approving the suggestion of His Excellency the Governor of the State, Prof. Dr. Lucas Nogueira Garcez. Brazilian members of the Board of Trustees were appointed to the Commission organizing the Congress, under the direction of Prof. Dr. Carlos Gama, Vice-President of the International Congress and Secretary General for South America.

The Ninth International Congress will be held from April 26 to May 2, 1954. The official topics are (1) experience with socialized medicine in different countries, (2) new uses of radiology with contrast media in the various surgical specialties, and (3) experience with antibiotics in all branches of surgery.

Since the Ninth International Congress will coincide with the Fourth Centennial of the city of São Paulo, it is hoped that the conference, in addition to being one of the most memorable ever held, will add much to the commemorative activities of São Paulo. In order that the Commission may obtain in advance a satisfactory idea of the number who will attend, to arrange the best possible accommodations for them and to insure that the program shall be absolutely functional, all who are interested are requested to write to the address below.

—Prof. Dr. Carlos Gama, Secretaria, Praca Ramos de Azevedo, 7.° Andar,
Sala 710, São Paulo, Brazil.

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The Causes of Hematogynaulos

NICHOLAS ALDERS, M.D., F.R.C.S., (EDIN.,) M.R.C.O.G., F.I.C.S.
BOURNEMOUTH, ENGLAND

THE observation of 2 cases of accumulation of blood above an obstruction in the female genital canal, arising from an endometrium stimulated by the administration of estrogens (Alders, Alders and Owen), has prompted a review of the causes of "hematogynaulos". This designation is suggested as a collective term for hematosalpinx, hematometra, hematotrachelos and hematocolpos, being derived from the Greek forms meaning *blood, female* and *tube*.

Two factors are necessary for blood to accumulate in a section or sections of the genital canal, namely, complete obstruction at some level, and bleeding above the obstruction. In any individual case, the causes of blockage and of hemorrhage may be unconnected; for instance, when senile adhesive atresia is combined with a bleeding neoplasm situated above the obstruction. On the other hand, the causes of obstruction and of bleeding may be identical; for instance, when both are due to a uterine fibromyoma. A certain degree of overlapping in the following summations of the causes of obstruction and the source of the collecting blood is therefore unavoidable.

The causes of obstruction occurring in the female genital tract (gynatresia) fall into two categories, namely, congenital abnormalities and acquired conditions. Of the congenital causative factors, imperfect canalization of the müllerian ducts at some level, most frequently just above the hymen, is the commonest single cause (11 of 19 cases of hematometra in Bernstein's and Walter's series; 13 of 83 such cases described by Bullard; 11 of 23 cases reported by Simon).

The acquired conditions that cause obstruction are: 1. Injury, which may be (a) mechanical (obstetric, surgical or the result of pressure), (b) thermic, or (c) actinic. 2. Inflammation. 3. Tumor, either benign or malignant. 4. Senile (hypohormonal) adhesive processes. 5. Displacement. 6. Artificial (estrogenic stimulation).

Mechanical Injury.—Obstetric: Cicatricial stenosis of the cervix may occur after labor (2 of Bernstein's and Walter's 19 cases; 12 of 70 cases of acquired hematometra described by Bullard; 2 of 12 such cases described by Simon). Similar occurrences have been reported by Allen, Bernard, Luyn, Tain, and Weisl.

Surgical: Postoperative obstruction may follow vigorous curettage as described by Feuchtwanger, Ottow, Porter, and Worrall; it may also occur after plastic operations on, or amputation of, the cervix (2 such cases figure in Bernstein's and Walter's series, 3 in Bullard's, 1 in Klaften's and 5 in Simon's; 1 case has been described by Lifvendahl).

Resulting from Pressure: Pressure by stem pessaries (Bullard; Simon) may also be responsible.

Thermic: Hot vaginal douches may be a cause (2 cases of Young's), as may cauterization of the cervix (14 such cases are reported by Bullard, 1 case each by Bernstein and Walter and by Henkin and 2 cases by Ross).

Actinic: Gynatresia may also follow radium treatment (a) for benign conditions (Alders and Owen; Gellhorn, 1922; Herring; Simon) or (b) for malignant conditions (Bernstein and Walter).

Inflammation: Injury and inflammation are frequently combined, injury being accompanied or followed by infection.

Tumor: Benign tumors, such as cervical fibromyoma (Iribarne and Ortiz; Klaften; Simon) or corporeal fibromyoma (Fer-

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From the Royal Victoria Hospital, Bournemouth.
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rari; Giardinelli), have been established as factors; so have malignant tumors, such as uterine carcinoma (Bernstein and Walter; Hallendorf and Loveland) or uterine sarcoma (Burger; Gosselin and Gregoire; Rouchy).

Senility: Senile (hypohormonal) adhesive processes may occur in the vagina or in the cervix (Alders; Diddle and Keettel; Gellhorn, 1917; Labhardt; Lefebre; Lepoutre).

Displacement: Displacement is represented by (a) uterine prolapse (Schockaert; Simon) and (b) tubal torsion (Driessen; Casagrande; Fuchs; Goldberg and Olim; Tauber; Terruhn; Vigholt). Tubal torsion during pregnancy with formation of a hematosalpinx has been described by Savage.

The causes of *hemorrhage* resulting in an accumulation of blood above an obstruction in the female genital tract may be classified thus:

Menstruation.—This is the commonest source of blood observed in the presence of hematocolpos and hematometra. (It is worth remembering that menstruation may recur after having been temporarily suppressed by treatment with radium, and blood may collect above an obstruction caused by the irradiation [Gellhorn, 1922; Herring]).

Disturbed Pregnancy. — This is the commonest source of blood observed in an isolated hematosalpinx.

Circulatory Disturbances.—These consist of (a) torsion of a tube (q.v.), healthy or diseased, leading to hematosalpinx, and (b) hemorrhage due to arteriosclerosis of endometrial vessels leading to hematometra (Hartig).

Inflammation.—Vaginitis, senile endometritis or tuberculous salpingitis may be a factor (Bullard; Klaften).

Tumor.—Among neoplastic factors are (a) benign tumor, such as submucous fibromyoma (Lepoutre), and (b) malignant tumor, such as endometrial carcinoma (Gellhorn, 1917; Ottow; Verdier) or endometrial sarcoma (Gosselin and Gregoire; Rouchy).

Artificial Estrogenic Stimulation of the Endometrium.—This has been described by Alders, Alders and Owen and Diddle and Keettel.

SUMMARY

1. A collective term, "hematogynaulos", is suggested for the conditions now known as hematosalpinx, hematometra, hematotrachelos and hematocolpos.

2. By means of a review of the world literature on this subject, an attempt is made to present a comprehensive classification of these conditions, based on their pathogenesis.

ZUSAMMENFASSUNG

1. Die Bezeichnung "Haematogynaulos" wird als Sammelbegriff fuer eine Reihe von Krankheitszustaenden, naemlich die Haematosalpinx, Haematometra, den Haematotrachelos und Haematokolpos vorgeschlagen.

2. Es wird ein Ueberblick ueber die einschlaegige Weltliteratur gegeben und der Versuch unternommen, mit ihrer Hilfe die betreffenden Krankheitszustaende auf Grund ihrer Pathogenese eingehend zu klassifizieren.

RIASSUNTO

1. Viene propsto il termine comprensivo di "ematoginaulo" per indicare l'ematosalpinge, l'ematometra, l'ematotracheloe l'ex-matocolpo.

2. Viene fatto un progetto di classificazione di tali affezioni su basi etiopatogenetiche, dopo una rassegna della Letteratura mondiale dell'argomento.

RÉSUMÉ

L'auteur suggère la terminologie "hématogynaulos" pour toutes les lésions gynécologiques associées à une hémorragie.

L'auteur, se basant sur la litt[illegible] mondiale, classifie ces [illegible]ns d[illegible] pathogénie.

RESUMEN

1. Se sugiere el término colectivo "hematoginaulos" para los padecimientos: hematosalpinx, hematometra, hematotraquelos y hematocolpos.

2. Por medio de una revisión de la literatura mundial sobre el tema, se intenta una clasificación comprensiva de estos parecimientos, basada en su patogénesis.

RESUMEN

1. Se sugiere el término colectivo "hematoginaulos" para los padecimientos: hematosalpinx, hematometra, hematotraquelos y hematocolpos.

2. Por medio de una revisión de la literatura mundial sobre el tema, se intenta una clasficación comprensiva de estos padecimientos, basada en su patogénesis.

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The rules and regulations adopted, as well as the criteria for admission and the details of procedure and protocol, will be announced in the near future.

Indications for Use of Fascial Grafts in Repair of Inguinal Hernia (Gallie's Operation)

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THE use of strips of fascia lata for the repair of inguinal hernia was first introduced by Gallie and Le Mesurier of Toronto in 1921, because of the high incidence of recurrence after operation at that time. This problem is still the bane of every herniotomist, although the recurrence rate may not be so high now as then. So much has been written in the past on the subject of hernia and the prevention of its recurrence that I hesitate to add my name to the host of authors who have contributed to this subject. Yet since hernias do recur (and this is only too well known by many sufferers from rupture) it calls for every effort on the part of the surgeon to perfect a technic to prevent the possibility of recurrence. In spite of the introduction within recent years of the use of various types of silk thread and silver wire, I am convinced that the use of fascial strips is still the best method of repairing certain types of inguinal hernia and that this technic should be more frequently used. There is no doubt that it is more time-consuming than some other methods, and some surgeons claim that they get equally good results by using silk in their repairs. This, it should be pointed out, is certainly true of certain types of hernia, and in these cases a fascial graft would, I admit, be quite unnecessary. However, in dealing with the types of hernia to be here described, it is questionable whether repair by silk or other suturing would prevent recurrence. In those cases in which a graft is needed the aim in using fascia lata is to produce a strong wall of fibrous tissue, which takes the place of a deficient or atrophied posterior wall of the inguinal canal. The hernias for which the use of fascial grafts is indicated are as follows:

1. *All recurrent hernias.* In my opinion the use of the fascial graft is far the most reliable method of preventing a further recurrence. Recurrence occurs as either a direct or an indirect hernia through a hole in the fascia transversalis. When a hernia recurs as a direct hernia there is a deficiency in the posterior inguinal wall, and this deficiency has to be made good by producing a wall or diaphragm of fibrous tissue. No other material can form this as efficiently as fascia lata, because when it is used living fibroblasts are introduced. When the recurrent hernia is oblique, the graft that is introduced produces an unstretchable fibrous ring round the internal ring, allowing only the cord to emerge and obviously leaving no room for the protrusion of a hernial sac.

2. *Large oblique inguinal hernias with a large defect in the fascia transversalis.* The defect in the fascia transversalis can be detected only after the sac has been ligated and removed. If the hole in the fascia transversalis admits two or more fingers the opening must be closed with stout catgut, leaving just enough room for the emergence of the cord. This area must then be reinforced by a ring of fascia lata as described later. In some cases of large oblique hernia the internal ring becomes so stretched medially as to lie directly behind the external ring, and the cord, instead of running an oblique course downward and medially, emerges directly from the abdominal cavity into the neck of the scrotum. It is no wonder that in some of these cases the hernia is diagnosed pre-

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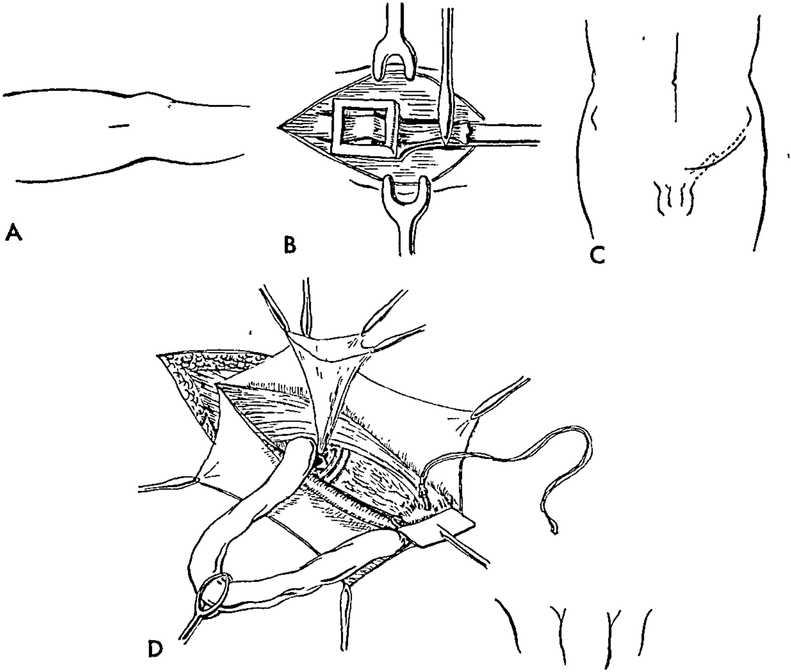

Fig. 1.—*A*, incision in outer side of thigh for obtaining fascia. *B*, fasciotome in position, ready for obtaining strip of fascia. *C*, line of incision, showing it traversing the line of the inguinal canal. *D*, inguinal canal exposed, showing ligature of sac at the level of the deep epigastric vessels and sac emerging through the hole in the fascia transversalis with the cord. Also shown is the first bite of the needle with fascia lata at the insertion of the inguinal ligament into the pubic tubercle.

operatively as of the direct inguinal type.

3. All direct hernias. Direct hernias occur usually in elderly patients who have, in addition, weak abdominal muscles. No true sac is present, and the hernia results from weakening of the sphincteric action of the muscles guarding the region of Hesselbach's triangle. As Gallie has pointed out, no dependence can be placed on the muscles of the inguinal canal in these direct hernias, but in the immediate neighborhood there are the conjoined tendon, the sheath of the rectus muscle and Poupart's ligament, all strong fibrous structures that will give firm anchorage for a fascial suture and permit an effective darn over the weak spot in the posterior wall of the inguinal canal. It is interesting to note that direct ingui hernias in women and children ar tremely rare, and I cannot recall having performed a graft operation patient of either type.

4. Inguinal hernias in ob

obese men who are potbellied, the muscular wall of the abdomen is of poor quality and infiltrated with fat, and there is often, in addition, a wad of omentum stuck down inside the sac. Repair of these hernias can be a great trial to the surgeon. The neck of the sac is often very large, and separation of the sac from the surrounding tissues must be carried out carefully. Repair by means of such sutures as floss silk, Chinese twist, or anything of a like nature, is risky for the obese patient, because of the likelihood of infection around an introduced foreign body. In fact, it is well worth while to have such patients admitted a week before the operation and given a full course of penicillin preoperatively.

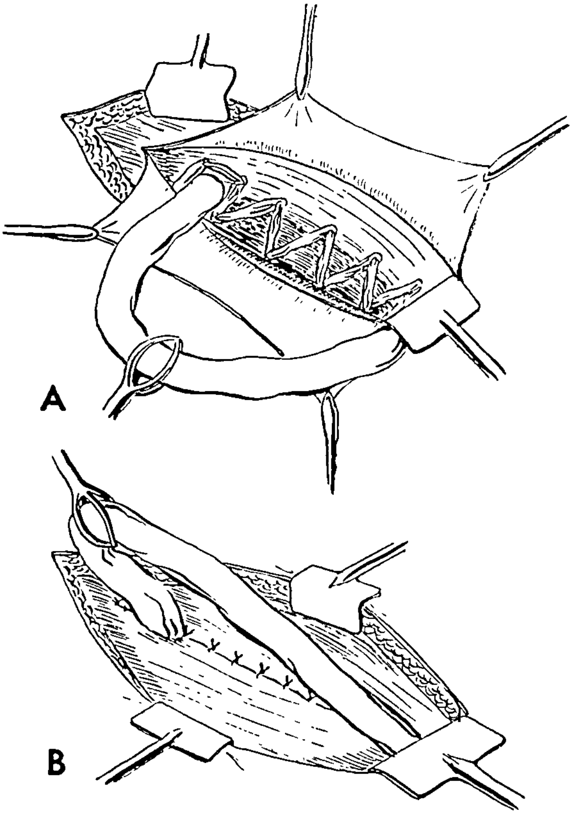

Fig. 2.—*A*, first layer of fascia lata completed, showing bridge of graft around the emerging cord. Return layer of fascia lata not shown here. *B*, external oblique muscle sewn up behind the cord; cord shown emerging in an upward and lateral direction and then proceeding downward and medially.

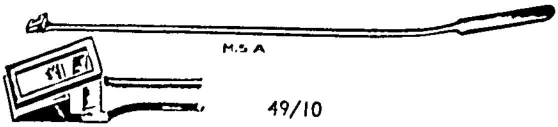

Fig. 3.—Small's fasciotome. The instrument is manufactured of stainless steel, with a double cutting edge.

5. *Sliding hernias* (*herniae en glissade*). The incidence of recurrence of these hernias is higher than that of any other type. So frequently does recurrence take place that some surgeons have even advised the drastic procedure of removal of the testes and cord and complete obliteration of the inguinal canal. It would be preferable to reduce the size of the cord to that accounted for by its minimum constituents (vas, veins and artery) and, after returning the hernial contents to the abdominal cavity, to carry out an effective closure of the canal by fascial graft, the internal ring being reinforced more strongly than usual.

6. *Hernias in patients with chronic bronchitis and chronic cough.* It used to be considered that a patient with a chronic cough was an unsuitable subject for hernial repair, and that recurrence was sure to follow operation. This is not quite true, however, and in certain selected cases of this type, provided other factors are excluded (e. g., enlarged prostate, failing heart), operation can be undertaken and satisfactory results obtained. Such a patient really suffers with pain in the hernial region every time he coughs. He is considerably benefited by operative repair, especially as in his case a truss is too often ineffective, and the only way the patient can control the rupture during coughing is to put his hands over the hernial site to prevent protrusion.

Technic.—The incision employed takes a more transverse direction than that which is usually made. Such an incision starts a fingerbreadth above the pubic tubercle and ends a fingerbreadth below the anterior superior iliac spine. The incision traverses the middle of the inguinal canal (Fig. 1*C*) and follows the skin lines of Langer. Consequently, when healed, it shows as a thin linear scar. The inguinal canal is exposed by incising the external oblique muscle right through the external ring; the cord is lifted out of the canal and the sac isolated, freed and tied at its neck at the level of the deep epigastric vessels (Fig. 1*D*). The opening in the fascia transversalis is now carefully inspected and its edges defined. The hole is sutured with No. 1 catgut, just adequate room being left for the cord to emerge.

The fascial strips, which have already been taken from the lateral aspect of the thigh by means of a fasciotome (Fig. 1, *A* and *B*; Fig. 3) and threaded onto a Gallie needle, are now darned into the posterior wall of the canal, producing a lattice repair. The first bite of the needle is made to traverse the periosteum over the pubic tubercle (Fig. 1*D*) where the inguinal ligament is inserted. The graft is anchored here by means of thread, and the darning is commenced first by taking a good bite into the rectus sheath. The darn is carried laterally, always taking good bites of the conjoined tendon and then the internal oblique and the reflected inguinal ligament until the internal ring is reached. Here a bridge of graft is made over the emerging cord (Fig. 2*A*), the bridge being measured carefully. The graft is next carried backward, reinforcing the bridge (not shown in diagram), and the darning is renewed in a medial direction to where the graft started. In this way an effective wall is made of fascia running the whole length of the inguinal canal. The cord is now retracted upward and the cut external oblique muscle is sewn behind it. While the external oblique muscle is being sewed up the cord is lifted upward and laterally, and the first stitch in the external oblique muscle is so placed that the cord is made to run obliquely upward and outward from the internal ring (Fig. 2*B*) and then downward and medially. This alternation of direction also insures against recurrence. The subcutaneous fat is sewn up over the cord, and the skin is closed with interrupted stitches.

SUMMARY AND CONCLUSIONS

1. The use of fascia lata in the repair of inguinal hernia is still advocated by the author. Apparently its employment is not so common now as it once was.

2. Certain types of inguinal hernia are discussed which are specially suitable for repair by fascial grafting, namely, direct hernia, oblique hernia with large openings in the fascia transversalis, hernia in the obese patient and sliding hernia.

3. A short description of the method of repair is given, and stress is laid on the necessity of anchoring the graft to the pubic tubercle, to the making of an effective bridge over the internal ring, and to bringing the cord out in an upward and outward and then downward and medial direction in front of the external oblique muscle.

4. The author emphasizes the fact that recurrences will be prevented only by meticulous attention to detail, by realizing where the weak spots are in the hernial canal and by placing the grafts in the right places. Recurrences are still frequently encountered, and in the author's opinion the use of fascia lata grafts can reduce their incidence.

RESUMEN Y CONCLUSIONES

1. El autor favorece aún, el uso de la fascia lata en la reparación de hernia inguinal. Aparentemente, actualmente su empleo no es tan común como solía ser.

2. Se discuten ciertos tipos de hernia que son especialmente apropiadas para reparación por injerto de fascia, como la hernia directa, la hernia oblícua con grandes aberturas en la fascia transversalis, la hernia del paciente obeso y la hernia por deslizamiento.

3. Se da una somera descripción del método de reparación basándose necesidad de fijar el injerto al tu pubiano, para la construcción de un

efectivo sobre el anillo interno, y trayendo el cordón afuera, en una dirección hacia arriba, hacia afuera y hacia abajo y hacia adentro, enfrente del músculo oblícuo mayor.

4. El autor hace notar el hecho de que las recidivas son prevenidas únicamente por atención meticulosa a los detalles, notando en donde se encuentran los puntos débiles en el conducto herniario y para la colocación de injertos en lugares correctos. Las recidivas son todavía frecuentes y en la opinión del autor, el use de injertos con fascia lata puede reducir su incidencia.

RÉSUMÈ

L'auteur préconise l'emploi des fascia lata pour la cure de la hernie inguinale. Il en énumère certains types plus propices. L'auteur décrit ensuite sa technique personnelle en insistant surtout sur la minutie des détails afin de prévenir la récidive, trop fréquente.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

1. Die Verwendung der Fascia lata zur Reparatur von Leistenbrüchen wird vom Verfasser immer noch empfohlen. Ihre Verwendung ist offenbar nicht mehr so häufig wie früher.

2. Gewisse Formen von Leistenbrüchen, die sich für die Reparatur mit Faszieneinpflanzung besonders eignen, werden erörtert, nämlich die direkte Hernie, die schräge Hernie mit weiten Oeffnungen in der Fascia transversalis, die Hernie bei fetten Kranken, und die gleitende Hernie.

3. Es wird eine kurze Beschreibung des Verfahrens gegeben, wobei besondere Betonung auf die Notwendigkeit gelegt wird, das Transplantat am Tuberculum pubicum zu verankern, eine haltbare Brücke über den inneren Ring zu bilden, und den Samenstrang erst nach oben und aussen und dann nach unten und innen vor dem äusseren schrägen Bauchmuskel herauszubringen.

4. Der Verfasser betont, dass sich Rückfälle nur durch sorgfältige Beachtung aller Details, durch Erkennung der schwachen Stellen im Leistenkanal und durch Anlage des Faszientransplantats an den richtigen Stellen vermeiden lassen. Rückfälle werden noch immer häufig beobachtet, und der Verfasser glaubt, dass ihr Vorkommen durch Anwendung von Fascia lata Verpflanzungen vermindert werden kann.

SUMARIO E CONCLUSÕES

1. O emprego do fascia lata para a cura da hernia inguinal é, mais uma vez, salientado pelo autôr. Aparentemente, contudo, êsse metodo não vem sendo tão utilizado hoje, como o era ha anos atraz.

2. Cortes tipos de hernia inguinal são estudados, para os quais o autôr indica especialmente o processo, como por esemplo nas hernias diretas, nas hernias obliquas, nos obesos e tambem nas hernias recidivantes.

3. Uma breve descrição do metodo é feita sendo realçada a importancia de que a inserção de feixe do fascia lata se processe sôbre o tuberculo pubiano, para fazer uma ponte efetiva sôbre a parêde interna, e para trazer o cordãe espermatico para cima e para fora, e em seguida, para baixo e para o meio, para diante do musculo externo obliquo.

4. O autôr salienta o fato de que as recidivas serão evitadas se os detalhes recomendados forem observados. As recidivas são ainda frequentemente encontradas, porém o emprego do fascia lata pode reduzir bastante essa incidencia.

CONCLUSIONI RIASSUNTIVE

1. Viene ancora raccomandato l'uso di fascia lata nella plastica delle ernie inguinali. Sembra che tale uso non sia più così diffuso come era una volta.

2. Vengono descritti alcuni tipi di ernia inguinale che si prestano meglio alla plastica mediante trapianti di fascia, e cioè le ernie dirette, le ernie oblique con una ampia apertura nella fascia trasversalis, le ernie nei soggetti obesi e infine le ernie da scivolamento.

3. Viene descritto brevemente il metodo di plastica, con particolare riferimento alla necessità di ancorare il trapianto al tubercolo del pube, di costruire un ponte effettivo *sull 'anello in terno e di portare il* funicolo in alto e in fuori e quindi in basso e medialmente, al davanti del muscolo obliquo esterno.

4. L'autore sottolinea il fatto che le recidive possono essere evitate solo da una meticolosa cura nell 'osservare i dettagli, dal-l'identificare i punti deboli del canale *erniario e dal sistemare i trapianti nella* sede esatta. Le recidive sono ancora troppo frequenti e l'autore pensa che l'impiego di fascia lata potrà ridurne il numero.

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The Brazilian Section of the International College of Surgeons is offering three Fellowships annually to Argentine medical students. The following Fellowships are available:

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Lymphosarcoma of the Small Intestine

Report of a Case and Review of the Literature

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SARCOMA of the gastrointestinal tract is rare, with lymphosarcoma the most common form. Three hundred and twelve cases have been reported.[1] One hundred and thirty-three have been reported in a ten-year period since 1941, which we have reviewed, making a total of 445 cases reported in the world literature. We are adding the report of a case which was unusual in that the small bowel series gave negative results one month prior to the episode of acute obstruction leading to exploration. This subsequently revealed the obstructing lymphoma instead of a peptic ulcer, which it had simulated clinically one month earlier.

Grossly, the tumor has four characteristic forms:[2]

1. The circumscribed, cufflike tumor independent of Peyer's patches. This obstructing type is the most common.
2. The polypoid type arising from solitary Peyer's patches.
3. The "plaquelike" tumor masses of the serosa.
4. Gyrate structures of tumor masses in the mucosal folds. Histologically, the tumor has two forms:[2]
    1. The lymphocytic type with small free cells, mature or immature and 4 to 6 microns in diameter.
    2. The reticular cell type with large, mature, reticulated pale-staining cells 8 to 12 microns in diameter.

The tumor occurs most frequently in the ileum.

In a study by Sugarbaker and Graver, 34 per cent of lymphosarcomas showed extranodal origin, the primary lesion occurring in the gastrointestinal tract in 5.5 per cent. Lymphoma of the small bowel was most frequent in the fourth decade of life in the 133 cases reviewed.

The symptoms were usually those of small bowel obstruction, with weight loss and fatigue. The average duration of symptoms was eight months. Peptic ulcer and acute appendicitis were the diseases most frequently simulated. Eight patients in our study were treated by appendectomy two months to two and one-half years prior to the discovery of a tumor. The ulcer symptoms are usually typical and occur in relatively young male patients, but the lesion, unless obstructive or occurring in the duodenum, usually was not demonstrated roentgenographically.

The most important physical sign was the palpation of an abdominal mass. Thirty-nine per cent of the patients entered the hospital with acute obstruction of the small bowel; 8 had intussusceptions, 1 of which was perforated. Acute obstruction precludes the use of a roentgen series on the small bowel, and the flat plate diagnosis was that of an obstructing lesion, which was made in 21 per cent of the cases.

The treatment is surgical excision when feasible. In the cases reported 82 (63 per cent of the 133) patients were laparotomized, and of these, 42, or 32 per cent, died in the immediate postoperative period (mortality rate, 10 per cent), as compared with the 17.6 per cent reported in 1932.[1c] Four of the 8 patients who died were

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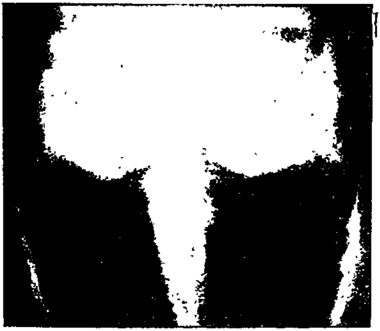

Fig. 1.—Upright chest film, showing distended loops of small bowel limited to the upper part of the abdomen. A diagnosis of "obstructing lesion of the jejunum" was made.

"hopeless cases," and only exploration or palliation was carried out. The average survival for the entire group was twenty-two and four-tenths months. In 1932 the survival rate was reported as 19 months (Ullman and Abeshouse). Marcuse and Stout collected 23 cases from the literature in which there were five-year cures. In twenty-one cases the tumors were surgically excised, and of the patients in this group 3 were given roentgen therapy in addition to the operation. Two patients were treated by roentgen therapy only (Marcuse and Stout).

The use of roentgen therapy, radioactive phosphorus or methyl bis postoperative seems to be a matter of individual choice.

REPORT OF CASE

Three months prior to his admission to the hospital, a 46-year-old lawyer complained of indigestion which had no definite relation to meals, type of food or cycle. Two months later, in another hospital his condition was diagnosed as "peptic ulcer" and he was given an ulcer diet and antacids. The symptoms disappeared on this regime but returned when he resumed a full diet. Three days prior to admission to St. Francis Hospital in Evanston he had an attack of generalized abdominal cramps. The next day he vomited food and bile. The pain became continuous rather than cramping, and there was mild abdominal distention. There had been no bowel movement for one day prior to admission. The patient had lost 6 pounds (2.7 Kg.) in two months. There was no melena.

A review of the systems revealed no abnormality.

The past medical history indicated bronchopneumonia three years, and brucellosis one year, prior to the patient's admission. He had never undergone a surgical operation. His mother had died of hypertensive cardiac disease at the age of 69; his father, of carcinoma of the prostate at 76.

Physical examination showed the patient to be well nourished and well developed but acutely ill. There was mild clinical dehydration. The temperature was 99 F., the pulse rate 68 and the blood pressure, in millimeters of mercury, 112 systolic and 82 diastolic.

The pathologic observations were limited to the abdomen, which was mildly distended. No scars and no peristaltic waves were perceptible. There was generalized tenderness but no rigidity or rebound tenderness. No masses were palpated, nor was a fluid wave present. The bowel sounds were hyperactive, and borborygmus was present. Rectal examination gave negative results. A blood cell count revealed 5,300,000 red cells per cubic millimeter, with 16 Gm. hemoglobin, and 16,400 white cells per

Fig. 2.—Appearanc lesion, gi
the impression of tumor f
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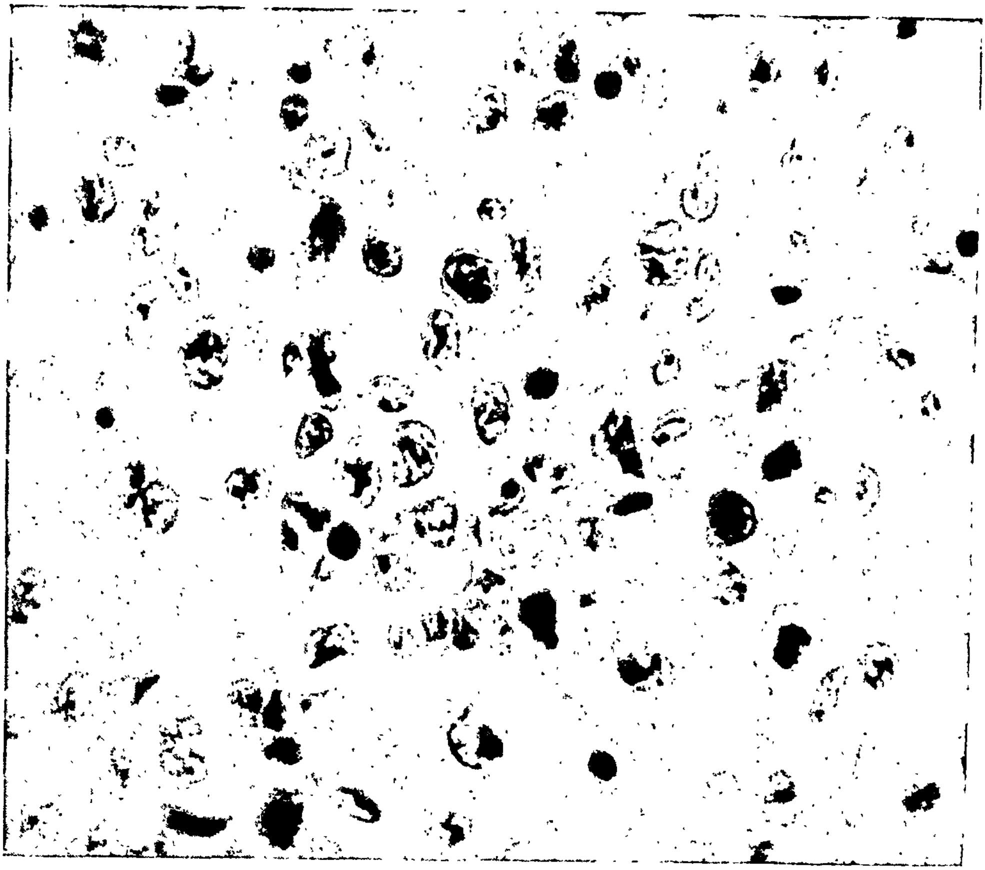

Fig. 3.—Photomicrograph (high power), showing a fairly solid mass of large round cells with plemorphism and many mitoses. Parallel strands of reticulum fibers traverse the neoplasm.

cubic millimeter. The value for nonprotein nitrogen was 32 and that for total proteins 8.1. The albumin-globulin ratio was 4.5:3.6.

A flat plate of the abdomen with the patient in the left lateral decubitus position and a film of the chest with the patient upright revealed distended loops of jejunum but no free subdiaphragmatic air. They were interpreted as indicating an obstructing lesion of the jejunum. (The small bowel series and a barium enema one month earlier had revealed no pathologic change.)

Laparotomy was performed through a right rectus incision. A dark red annular lesion of the jejunum, with dimpling of the terminal portion, was observed. The bowel above the lesion was dilated. Exploration of the mesentery failed to reveal nodes or induration, and examination of the rest of the abdomen failed to reveal any other pathologic condition.

The lesion and its mesentery were resected, and an end-to-end anastomosis was done. The abdomen was closed in layers without drainage, and the patient left the operating room in good condition.

The postoperative course was satisfactory, with a seven-day period of morbidity. The maximum temperature was 101 F., and the patient was ambulatory on the second postoperative day. Bowel sounds were present on the first postoperative day, and the patient had a bowel movement on the fifth. He received the usual postoperative care—Wangensteen suction, antibiotics and attention to the fluid and electrolyte balance.

Pathologic Report. — The pathologist (Dr. James W. Henry) described the lesion as an ulcerating lymphoma of the jejunum. The appearance was more consistent with origin from recticulo-endothelial cells rather than with origin from germinal lymphocytic cells. The muscularis and the serosal layer had been

TABLE 1.—*Location of Lesion*

Site	*No. of Cases*
Duodenum	9
Duodenum—jejunum	4
Jejunum	33
Jejunum—ileum	4
Ileum	63
Ileocecal	12
"Small intestine"	8

TABLE 2.—*Symptoms (98 Cases Available for Study)*

Cramping	53
Weight loss	34
Nausea	33
Vomiting	31
Fatigue	25
Chronic obstruction	21
Indigestion	20
Diarrhea	12
Melena	8
Ulcer pain	7
Appendicitis-like pain	7

TABLE 3.—*Physical Data (95 Cases Available for Study)*

Mass	34
Hyperactive bowel sound	30
Distension	27
Generalized abdominal tenderness	17
Peritoneal signs	5
Bowel sounds silent	4
Lymph nodes palpable	4

TABLE 4.—*Lymphosarcoma: Surgically Treated Patients Living Less Than a Year in Three Separate Studies*

Author	*Date*	*Cases*	*Death in First Year*	*Per Cent*
Speece	1914	54	33	61.0
Ullman & Abeshouse	1932	85	30	35.3
Mars & Bollinger	1951	82	20	24.4

invaded, but the mesentery was free of tumor.

Follow-up Note.—At the time of the patient's discharge from the hospital, roentgen study of the skull, the chest, the thoracic and lumbar vertebrae and the pelvis revealed no metastasis. At the time of this report, two years after the operation, the patient is free of symptoms. He is maintaining his weight and carrying out his usual activities.

SUMMARY

The literature is reviewed and a total of 445 cases of lymphosarcoma of the small bowel are reported. In comparison to earlier studies, the results of surgical treatment are improved because of increased awareness of the tumor, better preoperative and postoperative care and ability to accomplish the technical portion of the treatment to a greater degree of efficiency. A case is added in which the pathologic picture simulated that of peptic ulcer and responded to medical treatment one month prior to discovery of the true cause of the patient's illness, which was lymphosarcoma of the small bowel. The case report further illustrates the rapid growth of this lymphoma in one month—from a point at which roentgenograms of the small bowel showed no evidence of complete obstruction.

RÉSUMÈ

Les auteurs rapportent une étude sur 445 cas de lymphosarcome du petit intestin. Les succès actuels sont dus surtout à un diagnostic plus précoce, une meilleure technique opératoire et à l'attention éveillées des intéressés.

RESUMEN

Se revisa la literatura, habiendo sido comunicado un total de 445 casos de limfosarcoma del intestino delgado. En comparación a los primeros estudios, el tratamiento quirúrgico, a mejorado debido a la sospecha del tumor, mejor cuidado pre y postoperatorio y mayor capacidad para realizar la parte técnica del tratamiento con un grado mayor de eficiencia. Se comunica un caso en el cual el cuadro patológico se asemejaba al de una úlcera péptica y en el que hubo respuesta al tratamiento médico un mes antes del descubrimiento de la causa real del padecimiento del enfermo, que era un limfosarcoma del intestino delgado. El caso comunicado ilustra el crecimiento rápido de este limfoma en un mes, desde un punto en el que los roentgenogramas del intestino delgado no mostraban anormalidad hasta la obstrucción completa.

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Os resultados obtidos com o tratamento atual são muito melhores que os anteriormente observados, o que se deve a um melhor conhecimento acêrca do tumôr, a melhores cuidados pre e posopetério, maior habilidade técnica na resseção do tumôr, etc. Um case é apresentado pelos autôres no qual o caso patologico simulava a existencia de uma ulcera peptica sujeita a tratamento medico durante cêrca de um mês, quando se poude identificar a causa real do sofrimento do paciente, que era um finfe sarcôma do intestino delgado. O caso é apresentado com muitas ilustrações, tende tide uma evolução muito rapida, pois, um mês antes um estudo radiologico do intestino delgado fôra feito e nada havia que indiciasse a existencia do tumôr, que, no momento da operação apresentava o quadro de obstrução completa do intestino.

RIASSUNTO

E' stata fatta una revisione della letteratura e sono stati rintracciati 445 casi di linfosarcoma del tenue. In confronto con gli studi più antichi, i risultati della cura chirurgica sono assai migliorati a causa della maggior conoscenza dell 'affezione, della più efficace terapia pre- e post-operatoria e dalla possibilità di compiere la parte tecnica della cura col massimo grado di efficienza. Viene presentato un caso il cui quadro simulava quello dell 'ulcera peptica e che dispose alla cura medica un mese prima che si scoprisse la vera causa del male e cioè un linfosarcoma del tenue. Il caso inoltre illustra i rapido sviluppo del tumore, che in un mese passò dalla invisibilità radiologica alla completa ostruzione.

ZUSAMMENFASSUNG

Die Prüfung der Literatur ergibt eine Gesamtzahl von 445 berichteten Fällen von Lymphosarkom des Dünndarms. Im Vergleich mit früheren Arbeiten haben sich die Ergebnisse chirurgischer Behandlung verbessert. Das ist zurückzuführen auf bessere Kenntnis der Erkrankung, bessere prae- und postoperative Behandlung, und auf die Möglichkeit, den technischen Teil der Behandlung mit grösserer Fertigkeit und besser auszuführen. Die Verfasser fügen einen eigenen Fall hinzu. Hier handelte es sich um ein Krankheitsbild, das dem eines Magengeschwürs ähnelte und das auf medikamentöse Behandlung einen Monat vor der Entdeckung der eigentlichen Ursache, nämlich eines Lymphosarkom des Dünndarms, reagierte. Der Bericht gibt eine Illustration von dem rapiden Wachstum dieses Lymphoms innerhalb eines Monats: Von einem Zustand der noch keinerlei Roentgensymptome zeigte bis zur Entwicklung völligen Darmverschlusses.

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To Our Contributors Abroad

We regret to announce that under current publishing conditions it has become impossible for the *Journal* to arrange the translation into English of original articles submitted in other languages. With the single exception of articles written specifically for the *Seccion en Espanol,* which, of course, do not require translation, we must therefore request that all articles henceforward be submitted in the English language. Prompt publication can be greatly facilitated if all manuscripts are typed in double or triple space to allow room for editorial corrections. Your cooperation will be deeply appreciated.

1953 MEETINGS OF THE INTERNATIONAL COLLEGE OF SURGEONS

REGIONAL DIVISION MEETINGS, UNITED STATES SECTION

MISSOURI DIVISION, Statler Hotel, St. Louis, Missouri, March 31 to April 2. Dr. Roland M. Klemme, 4952 Maryland Avenue, St. Louis, Missouri, Chairman.

TENNESEE DIVISION, HERBERT ACUFF MEMORIAL MEETING, Knoxville, Tennessee. April 24-25. Dr. Park Niceley, Acuff Clinic, 514 West Church Street, Knoxville, Tennessee.

ILLINOIS DIVISION, Congress Hotel, Chicago, May 5-6. Dr. Karl A. Meyer, 30 N. Michigan Avenue, Chicago 2, Illinois, Chairman.

EIGHTEENTH NATIONAL ASSEMBLY, UNITED STATES SECTION, Waldorf-Astoria Hotel, New York City, September 14-18. Dr. Horace E. Ayers, 75 Central Park West, New York 23, Chairman.

INTERNATIONAL MEETINGS*

FRENCH AND DUTCH SECTIONS, Palais de l'Institut Colonial, Amsterdam, The Netherlands, April 8-10. Professor Raymond Darget, 17 rue Casteja, Bordeaux, France, Chairman.

ITALIAN SECTION, University of Rome, Italy, June 5, 6 and 7. Professor Raffaele Paolucci, Via a Guattani 8, Rome, Italy, Chairman.

SECOND ASSEMBLY BRAZILIAN SECTION AND FIRST PAN AMERICAN CONGRESS, Curitiba, Parana, Brazil, October 5-9. Professor Rudolpho Freitas and Dr. Waldyr Silva Prado, Rua Cesareo Motta 112, Sao Paulo, Brazil, Chairmen.

EIGHTEENTH ANNUAL CONGRESS

United States and Canadian Sections

NEW YORK, WALDORF ASTORIA HOTEL, September 14-18. Dr. Horace Ayers, F.A.C.S., F.I.C.S., General Chairman. For full information address:

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Fracture of Femoral Shaft with Fracture of Neck of Same Femur

Treatment with Medullary Nail for Shaft and Knowles Pins for Neck

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WHEN today's automobiles, powered for speed and mechanically so designed that they seem to operate without guidance, become instruments of destruction, they frequently confront the medical profession with complex and bizarre injuries almost unknown to the surgeons of former years. Previously such injuries were, as a rule, immediately fatal, as surgeons then did not have the excellent supportive, diagnostic and therapeutic measures now at their command.

In this paper an unusual combination of femoral fractures will be presented, together with a method of treatment that has been found to yield extremely satisfactory results. In each of the cases to be presented the fracture or fractures resulted from severe trauma, with a head-on automobile collision as the immediate cause, and in all of the 4 cases there were other associated injuries indicating the extent of the trauma involved.

Fracture of the shaft of the femur associated with fracture of the neck of the same femur is not a frequent occurrence; no reports of this type of injury were to be found in a comprehensive survey of the literature. A number of reports of fracture of the shaft of the femur complicated by dislocation of the hip were found, and this also, according to Wiltberger and his associates, is an extremely rare lesion that presents a therapeutic problem. These authors found only scanty mention of this type of injury, although they were convinced that many such injuries occur in this automotive age and go unreported.

CASE 1.—A 28-year-old white man, a regular Air Force sergeant, while driving a car, was involved in a head-on collision on June 12, 1950, and sustained multiple injuries. Examination showed a compound comminuted fracture of the left elbow and marked deformity over the middle third of the left femur, with about 1 inch (2.5 cm.) of shortening of the left leg. There was tenderness to palpation over the left greater trochanter, and pain occurred on any movement of the left lower extremity.

A roentgenogram of the left femur showed a fracture of the shaft, with some overriding of fragments, and an avulsion of the left greater trochanter (Fig. 1*A*). Roentgenograms of the left knee demonstrated a fracture of the left patella (Fig. 1*B*). Roentgenograms of the left elbow showed a comminuted fracture in the supracondylar region of the left humerus.

Open reduction of the left elbow with insertion of three screws was done immediately. The left leg was placed in skeletal traction.

One week after admission a medullary nail was inserted into the left femur.

On the following day, check roentgenograms of the left femur showed the presence of a fracture of the base of the neck, with associated avulsion of the greater trochanter (Fig. 1*C*). Close review of the films taken on admission showed these conditions to have been present prior to nailing.

Two weeks after admission the f [illegible] the femoral neck was reduced and [illegible] three Knowles pins (Fig. 1*D*).

The patient made satisfac [illegible] prog [illegible] since his discharge has [illegible]

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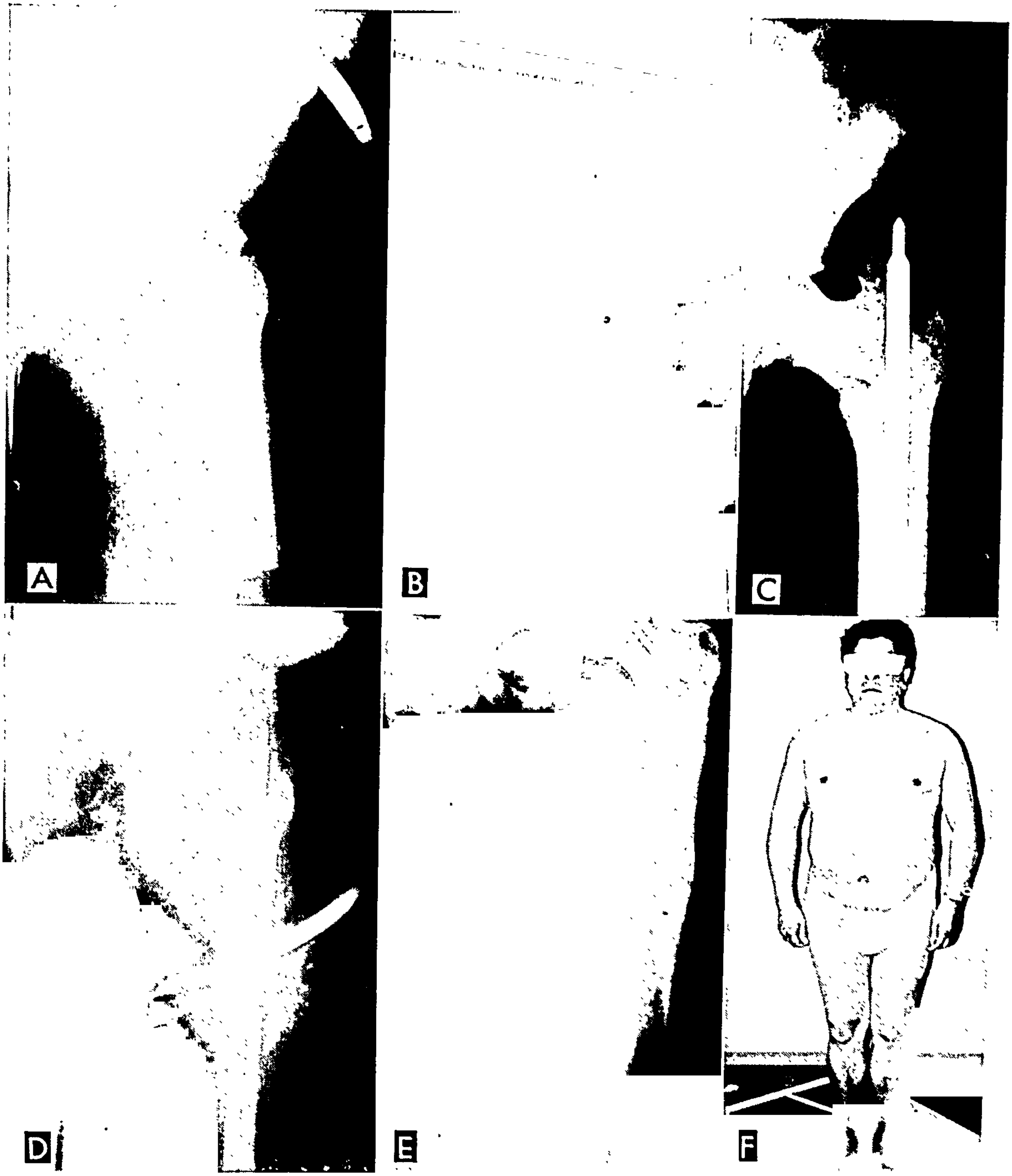

Fig. 1. (*Case* 1).—*A*, roentgenogram taken on admission, showing transverse fracture of shaft of left femur, avulsion of tip of greater trochanter and suggestive fracture line at base of neck. *B*, roentgenogram showing fracture of left patella. *C*, roentgenogram taken after medullary nailing showing avulsion of tip of greater trochanter and demonstrating fracture of base of neck more clearly. *D*, roentgenogram taken after insertion of three Knowles pins for fracture of base of femoral neck. *E*, roentgenogram twenty-one months after injury, taken after removal of medullary nail, showing excellent healing of fractures of shaft and neck of left femur. *F*, patient as he is today, twenty-one months after injury.

with the Air Force. An evaluation of his status by the Chief of Surgery at his present station, twenty-one months after the injury, showed the presence of a slight limp, apparently compensating for slight shortening of the left leg. No limitation of motion was present in the left hip or the left knee. Roentgenograms taken at that time showed good union of both fractures, shaft and neck (Fig. 1, *E* and *F*).

CASE 2.—A 28-year-old white man, while driving a car, was involved in a head-on collision on July 29, 1950, sustaining multiple injuries.

Examination on admission showed multiple contusions, abrasions and lacerations of the face and chest. There was a deformity of the right thigh, with ecchymosis and swelling in the midshaft region. A laceration over the left kneecap was observed.

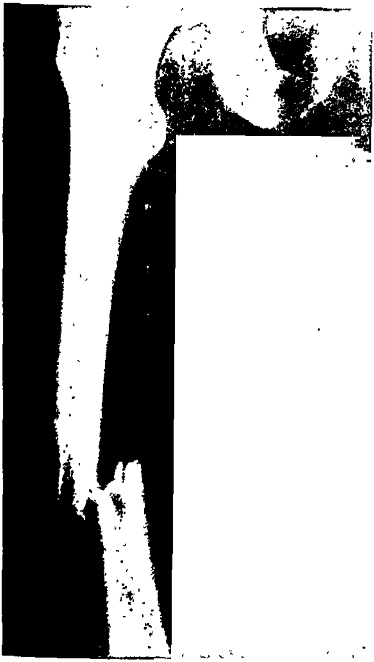

Fig. 2 (*Case* 2).—Roentgenogram taken on admission, showing transverse fracture of shaft of right femur.

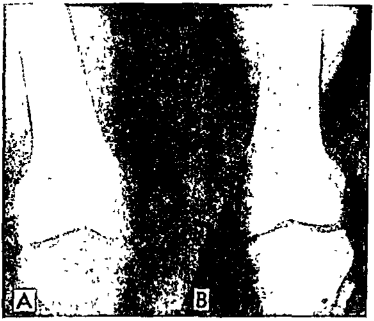

Fig. 3. (*Case* 2).—Roentgenogram of knee, demonstrating linear fracture of distal end of right femur.

Roentgenograms showed a fracture of the midshaft of the right femur (Fig. 2).

Skeletal traction was applied to the right leg. Ten days after admission open reduction and medullary nailing of the shaft of the right femur was performed.

Postoperative roentgenograms showed the presence of a fracture of the neck of the right femur, which had been overlooked in the films taken on admission (Fig. 4*A*).

One week after the first operation, a closed reduction and insertion of three Knowles pins for the fracture of the neck of the femur was performed (Fig. 4*B*). Postoperative progress was uneventful. Five weeks after the injury the patient was allowed out of bed on crutches, with no weight bearing. Partial weight bearing was begun three months after insertion of the Knowles pins.

The medullary nail was removed from the right femur eighteen months after the injury.

Roentgenograms taken after removal of the medullary nail, eighteen months after the injury, showed excellent healing of both fractures of the right femur, shaft and neck (Fig. 4*C*). There was no limitation of motion in either the right knee or the right hip. The patient walked in a perfectly normal manner (Fig. 4*D*).

CASE 3.—A 22-year-old white man, while driving an automobile on Sept. 7, 1950, had a head-on collision and suffere [illegible] iple injuries He was treated at a

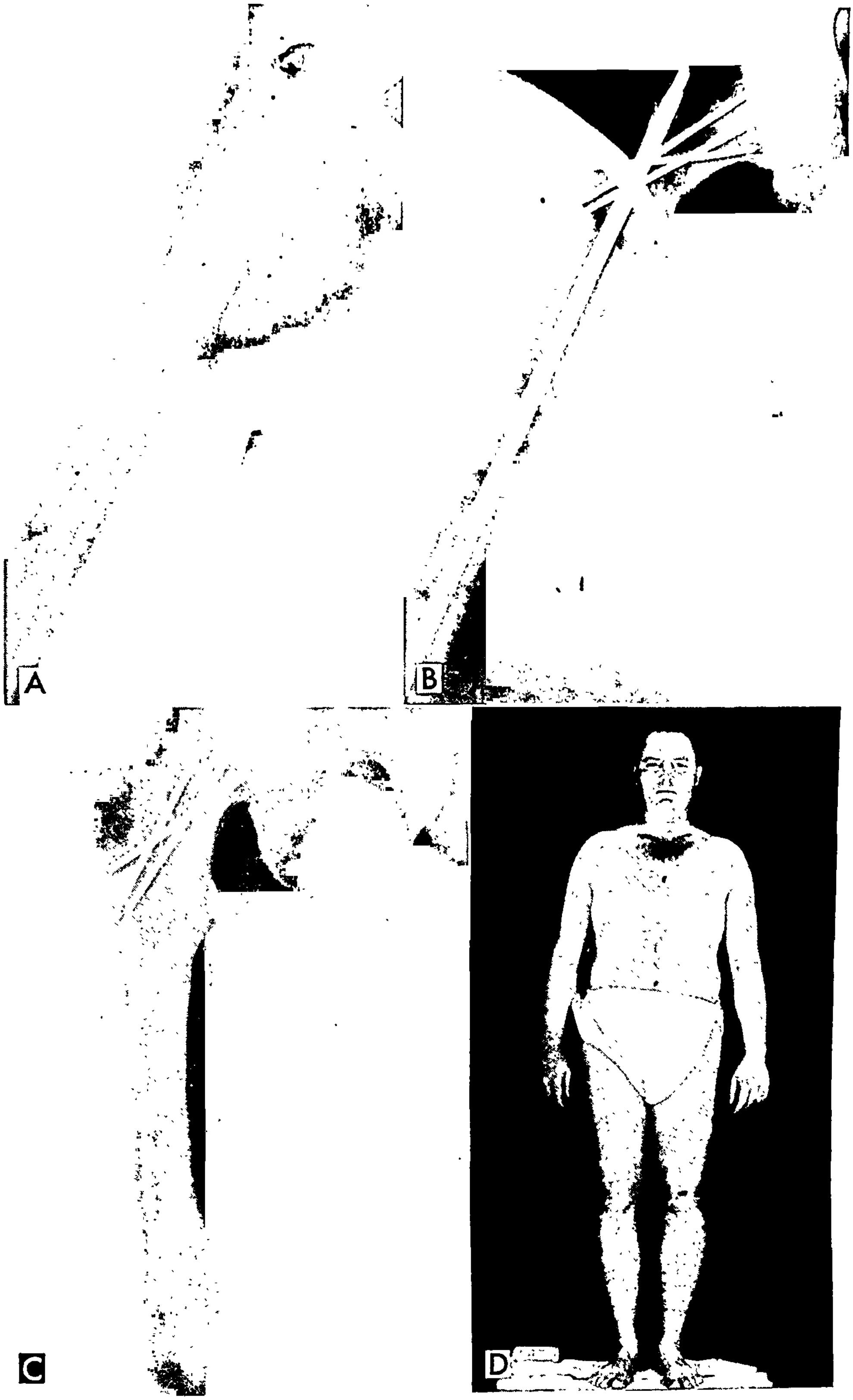
A
B
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Fig. 4 (*Opposite*).—Roentgenograms taken in Case 2. *A*, roentgenogram taken after medullary nailing, showing Pauwels type III fracture of neck of femur. *B*, roentgenogram taken after insertion of three Knowles pins for fracture of neck of femur. *C*, roentgenogram taken eighteen months after injury. Medullary nail has been removed. Note excellent healing of fractures of shaft and neck of right femur. *D*, patient as he is today, eighteen months after injury.

week, after which time he was transferred to this hospital. Treatment at the other hospital consisted of Kirschner wire traction through both femoral condyles.

Examination on admission showed wounds of both thighs, which had been sutured. The patient was in skeletal traction. Roentgenograms showed a transverse fracture of the shaft of the right femur at the middle third; an oblique fracture of the shaft of the left femur at the middle third, and a fracture of the neck of the femur on the left (Figs. 5 and 6*A*).

Two weeks after the injury, open reduction of the right femur was performed and a medullary nail inserted.

Three weeks after the injury, at the same operation, open reduction and insertion of a medullary nail with two supplementary screws for the comminuted fracture of the shaft of the left femur, and open reduction and insertion of three Knowles pins for the fracture of the neck of the femur was performed (Fig. 6*B*).

The patient made slow progress after the operation on the left femur, and it became necessary to substitute a shorter nail for the original one, as the nail became relatively too long owing to absorption and shortening at the

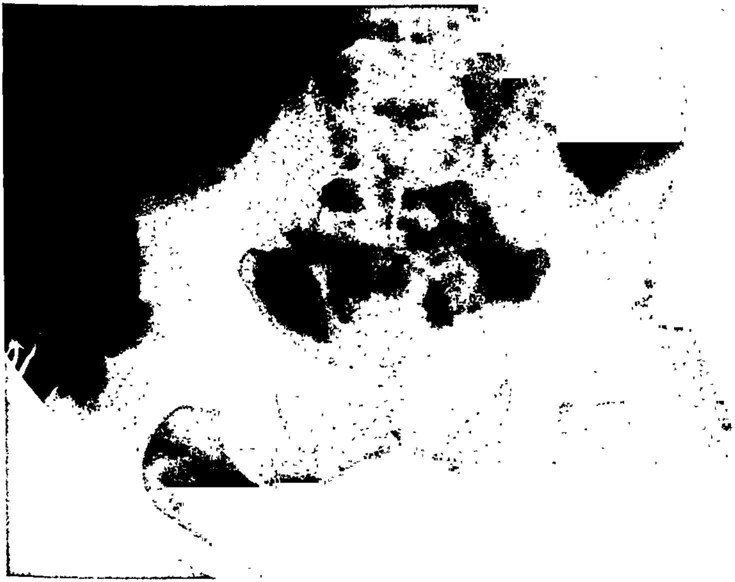
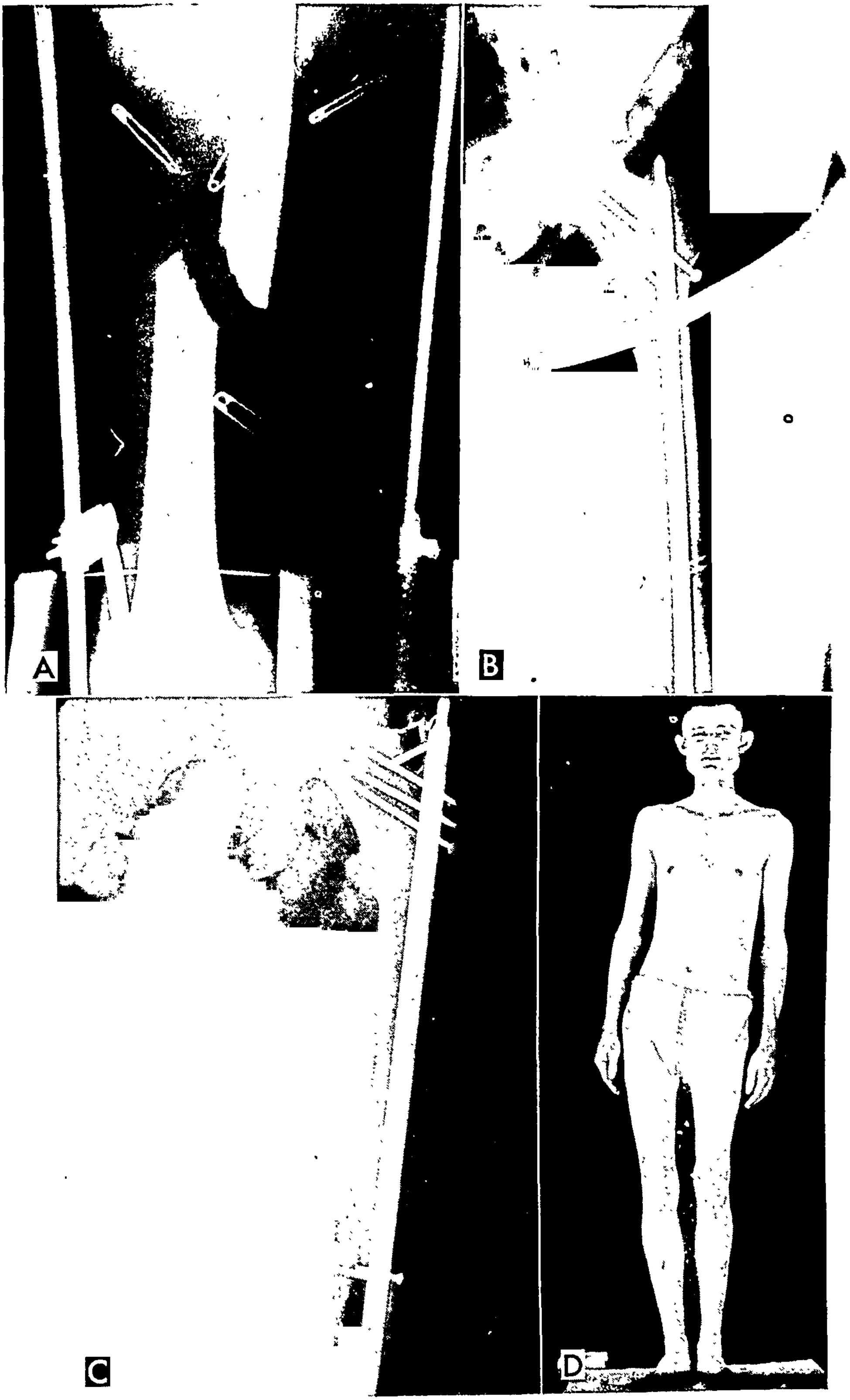


Fig. 5 (*Case* 3).—Roentgenogram taken on admission, showin
type III.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fracture site of the left femoral shaft. Because of persistent complaints referable to the left knee associated with clinical signs, an arthrotomy was performed seven months after the original injury, revealing a torn medial meniscus, which was excised, as well as a tear of the patellar tendon, which was repaired.

After this operation the patient made steady progress, and eighteen months after the injury examination showed good clinical union, with no limitation of motion at the left hip or the left knee, but with approximately 1 inch (2.5 cm.) of shortening of the left leg. This was easily corrected with a lift to the heel and sole of the left shoe. Roentgenograms taken at that time showed good union of both fractures of the left femur, shaft and neck (Fig. 6*C*).

CASE 4.—A 46-year-old Chinese male, while driving an automobile on Dec. 31, 1951, was involved in a head-on collision and suffered multiple injuries. He was taken to the City Hospital and was transferred to this service on the following day.

Examination on admission showed a clouded sensorium, laceration of the forehead, pneumothorax on the right and a compound wound of the right thigh, with deformity. Roentgenograms showed a fracture of the shaft of the right femur and a fracture of the neck of the same femur (Fig. 7*A*); a comminuted displaced plateau fracture of the left tibia; a fracture of the left radius; a fracture of the left second metacarpal bone, and multiple rib fractures on the right.

The compound wound of the right thigh was debrided and closed. Skeletal traction was applied to the right leg. Other injuries were treated.

Three weeks after injury, at the same operation, open reduction of the fracture of the shaft of the right femur with insertion of a medullary nail (Fig. 7*B*) and open reduction of the neck fracture and insertion of three Knowles pins was performed (Fig. 7*C*). After the operation the right leg was placed in balanced suspension.

During convalescence from this operation, the patient complained of pain on motion of the right knee. Check roentgenograms showed a comminuted fracture of the right patella (Fig. 7*D*), part of which was therefore excised.

Roentgenograms taken four months after the injury showed beginning union of the fractures of the neck and the shaft of the right femur (Fig. 7*E*). The patient has considerable limitation of motion of the right knee, which is beginning to respond to physiotherapy. Partial weight bearing on the right leg was begun at this time (Fig. 7*F*).

COMMENT

In these days of increased speed one often encounters unusual types of fractures, and it is a credit to the profession that surgeons have been able to keep abreast in the treatment of these fractures by improvising new and improved methods. In all treatment of fractures Bruce Gill's aphorism aptly applies: "Study principles rather than methods. A mind that grasps principles will devise its own methods."

No attempt will be made to evaluate the advantages or disadvantages of various forms of treatment for this type of injury, as such an evaluation is beyond the scope of this paper.

In several of the cases there were serious associated injuries, and the treatment of these often took precedence over the definitive treatment and/or materially added to the problem of management.

The treatment in these 4 cases was a combined one—the use of a medullary nail for the femoral shaft and three Knowles pins for the femoral neck.

Medullary nailing[2] has received great impetus since the end of World War II, and has now become accepted as the treatment of choice for transverse fractures of the shaft of the femur at the level of the isthmus; it may be used in other fractures

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Fig. 6—(*opposite*).—*A*, roentgenogram taken on admission, showing oblique fracture of shaft of left femur with an incomplete butterfly fragment. *B*, roentgenogram taken after medullary n [illegible] or shaft and insertion of three Knowles pins for neck. *C*, roentgenogram taken eighteen injury, showing excellent healing of fractures of both neck and shaft. A Phillips scr loop attached to proximal end of medullary nail can be seen and was used to prev backing out again, as occurred on one occasion. *D*, patient as he is today, show shortening of left leg, which was easily corrected with a lift to the

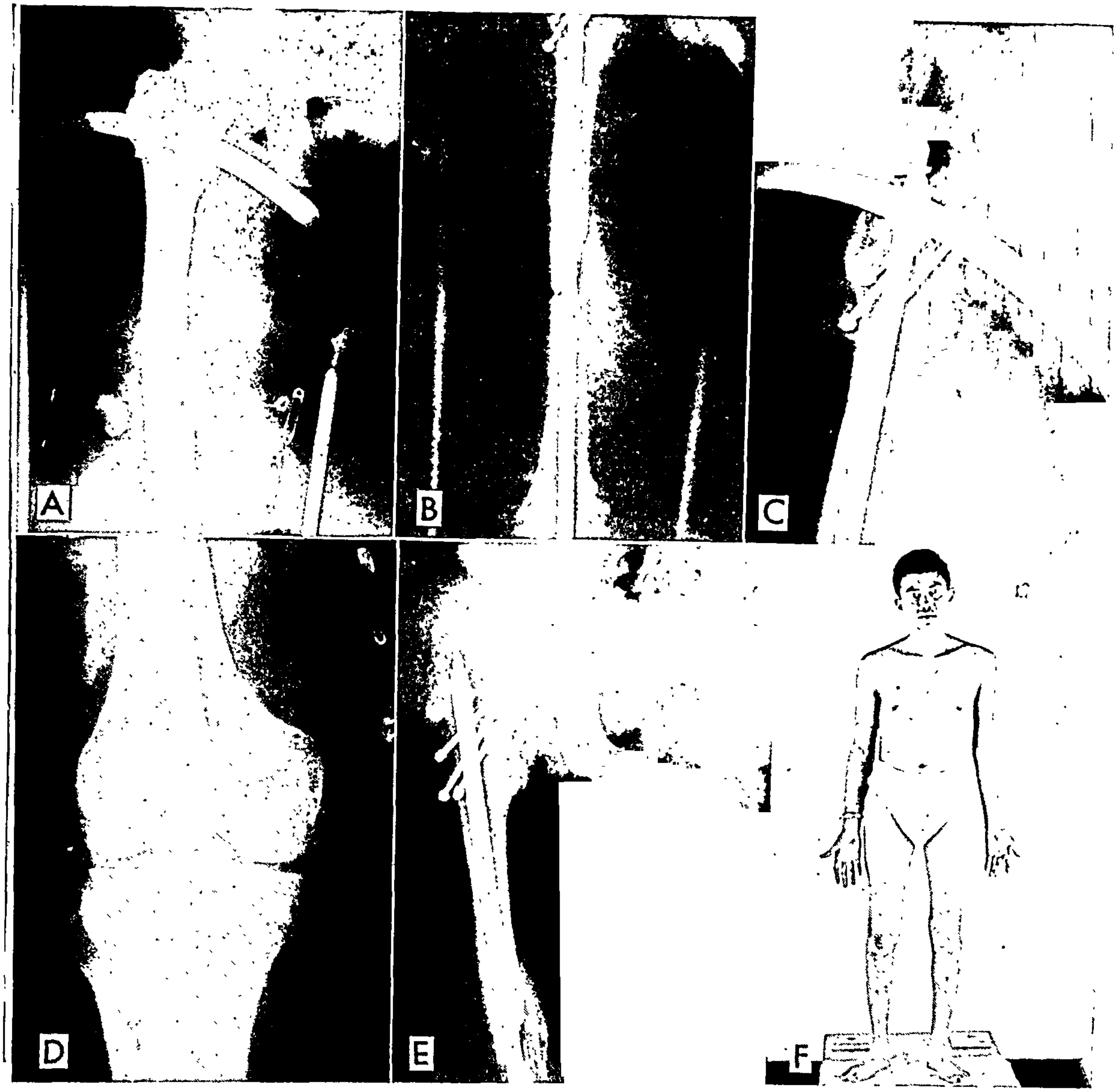

Fig. 7 (*Case* 4).—*A*, roentgenogram taken on admission, showing fracture of femoral neck (Pauwels type II), and comminuted fracture of shaft. *B*, roentgenogram showing fixation of fracture of shaft with medullary nail. *C*, roentgenogram showing fixation of fracture neck of femur with three Knowles pins. *D*, roentgenogram demonstrating the comminuted fracture of the right patella. *E*, roentgenogram four months after injury showing good healing of the fractures of the neck and shaft of the right femur. *F*, patient as he is today, eight months after injury.

of the shaft, however, in selected cases.

The use of Knowles pins[3] for fracture of the neck of the femur has been advocated since the thirties and has many avid adherents.

In 2 of the cases (1 and 2), the fracture of the neck was not discovered immediately, which necessitated a second operation. In the first 2 cases, as the medullary nail was already in place, not many possibilities as to treatment of the fracture of the neck were applicable. In view of the good results obtained from the empiric use of the medullary nail for the shaft, supplemented by the three Knowles pins for the neck, in the first 2 cases, the same treatment was employed in Cases 3 and 4.

The question may be asked as to whether retrograde insertion of the medullary nail into the proximal fragment could have produced the fracture of the neck of the femur. In the third and fourth cases, the fracture of the neck was visualized before the medullary nailing, and a review of the preoperative roentgenograms demonstrated the presence of the neck fracture in Cases 1 and 2, although that diagnosis was not made until check roentgenograms had been taken after insertion of the medullary nail.

In accidents resulting from severe trauma it is wise to consider the possibility of associated injuries as well as the immediately presenting ones. In many cases of severe trauma a complete skeletal survey may be indicated, but this need may be modified to some extent by a thorough and complete physical examination.

The 4 cases here presented had noticeable similarities; in each case the patient was the driver of a car involved in a head-on collision and suffered multiple injuries.

In 2 cases, 1 and 4, there was a fracture of the patella on the same side; in Case 2 there was a linear fracture of the distal end of the femur; and in Case 3 there was an injury to the knee necessitating excision of the medial meniscus and repair of a torn patellar tendon at a later operation.

All of the shaft fractures were located in the vicinity of the isthmus and were suitable for medullary nailing. All four shaft fractures have healed well, and the only one in which a complication occurred was that in Case 3, in which there were resorption and shortening at the fracture site (approximately 1 inch).

There has been good healing of all 4 neck fractures, with no evidence of nonunion or of necrosis of the head. In all cases great pains were taken to obtain as nearly perfect a reduction as possible before insertion of the Knowles pins, as in our opinion this is essential for good results. Eric Lloyd succinctly stated: "The bad results of hip nailing are the results of bad nailing.[4]" Partial weight bearing on the involved extremity was started usually at three months, but varied with each individual case.

Frank Kreuz,[5] Chief of Orthopedics at Oakland Naval Hospital, has observed 4 similar cases. In 1 the fracture of the neck was not discovered until after the shaft fracture had been treated with a medullary nail. The neck fracture was a typical impacted abduction fracture with valgus. Nothing was done for the neck fracture and the patient obtained a perfect result with no evidence of necrosis of the femoral head. Another patient, with a nonimpacted, partly extracapsular fracture of the neck, was treated with continuous skeletal traction as for a simple fracture of the shaft of the femur, with excellent results. In the 2 other cases, the shafts of the femurs were plated and the intracapsular fractures were nailed with Smith-Petersen nails.

SUMMARY

1. The authors present 4 cases of fracture of the shaft of the femur with associated fracture of the neck of the same femur, successfully treated by means of a medullary nail for the shaft and three Knowles pins for the neck.

2. It is important to be on the lookout for concomitant injuries other than the presenting one in this age of severe trauma associated with automobile accidents. In 2 of the 4 cases presented the associated fracture of the neck of the femur was not immediately discovered, which necessitated further surgical intervention. In cases of fracture of the femoral shaft resulting from severe trauma, an anterior-posterior view of the pelvis, with roentgenograms of the same knee, is recommended to rule out the presence of associated injuries.

RIASSU

1. Gli Autori presen
tura della diafisi del
frattura del collo del fe
con successo mediante

dollare della diafisi e inchiodamento del collo.

2. E'molto importante far attenzione alle lesioni associate in questi gravi traumi da incidente automobilistico. In 2 dei 4 casi presentati la frattura del collo femorale non era stata notata sul momento e rese necessario un intervento successivo. In ogni caso di frattura della diafisi del femore dovuta a un trauma grave si raccomanda di eseguire una lastra anteroposteriore del bacino ed una del ginocchio per svelare eventuali fratture associate.

ZUSAMMENFASSUNG

1. Der Verfasser berichtet ueber vier Faelle von Oberschenkelschaftbruechen, bei denen gleichzeitig ein Schenkelhalsbruch des gleichen Femurs vorlag. Die erfolgreiche Behandlung bestand in Einfuehrung eines Marknagels in den Schaft und von drei Knowlesnaegeln in den Schenkelhals.

2. Im Zeitalter der Automobilunfaelle, wo es zu schweren Verletzungen kommt, ist es wichtig, darauf zu achten, ob ausser den offensichtlichen Verletzungen noch andere vorhanden sind. In zwei von den hier dargestellten vier Faellen waren die Begleitbrueche des Schenkelhalses nicht gleich entdeckt worden, wodurch weitere chirurgische Massnahmen notwendig wurden. Um das Vorhandensein von Begleitverletzungen auszuschliessen, wird eine Roentgenaufnahme des Beckens nebst Aufnahmen des gleichseitigen Knies in allen Faellen von Oberschenkelschaftbruechen empfohlen, die durch schwere Gewalteinwirkung entstanden sind.

RÉSUMÉ

Les auteurs ont traité une fracture du corps et du col du fémur par un clou placé dans le médullaire et trois clous de Knowles dans le col. Les auteurs discutent sur la nécessité d'un examen systématique du bassin surtout après les accidents d'automobile afin de ne pas oublier certaines fractures discrètes.

RESUMEN

1. Los autores presentan 4 casos de fractura de la díafisis del fémur con fractura asociada del cuello del mismo, tratadas con éxito por medio de un clavo medular para la díafisis y tres alfileres de Knowles para el cuello.

2. Es importante estar alerta para lesiones concomitantes, en esta época de graves traumatismos asociados a accidentes automovilísticos. En 2 de los 4 casos presentados la fractura asociada del cuello del fémur no se descubrío inmediatamente, lo que requirió intervención quirúrgica posterior. En los casos de fractura diafisiaria femoral por traumatismo grave se recomiendan roentgenogramas anteroposterior de la pélvis y de la rodilla homolateral, eliminándose en esta forma la presencia de lesiones asociadas.

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Five Years' Experience with Vagotomy and Gastroenterostomy for Duodenal Ulcer

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WHEN one reviews many of the reported results of surgical treatment of peptic ulcers, one is impressed by the frequency with which some authors have failed to take certain important factors into due consideration. Duodenal ulcer, gastrojejunal ulcer and gastric ulcer are in many respects three different diseases, and should be clearly separated in tabulating the results of surgical treatment. In analyzing the values of various operations for duodenal ulcer one should consider the emotional status of the patient, the duration and character of the symptoms, the history of complications, such as perforation, hemorrhage and obstruction, the findings at laparotomy, the technic of the operation performed, the experience of the surgeon, the length of the postoperative period of observation, and the testimony of the patient himself.

Controversies as to the best type of operation for duodenal ulcer will continue until a significantly weighty body of critical analyses has accumulated on large numbers of patients over an adequate period. Vagotomy alone admittedly carries a high percentage of failures in the treatment of duodenal ulcer, as does gastroenterostomy alone. When these two procedures are combined, the results are much more satisfactory and may be compared with the results of subtotal gastric resection. The vagotomy must be complete, or nearly so, and the gastroenterostomy must be carefully fashioned to allow proper emptying of the stomach. Poor results due to faulty technic are too often used as evidence to discredit vagotomy and gastroenterostomy. The technic of gastric resection is even more exacting, yet poor results from this operation in the hands of some surgeons are not commonly used to discredit resection in the treatment of duodenal ulcer.

In discussing the relative merits of vagotomy with gastroenterostomy and gastric resection as performed by experienced surgeons in comparable cases of duodenal ulcer, there are two major general considerations: the technical details and the end results. The former operation requires about ninety minutes on the average, carries a mortality rate of 1 per cent or less and leaves the entire stomach, on which additional surgical procedures can be carried out, if necessary, at a later date. Gastric resection requires two to three hours, has at least twice the mortality rate in most hospitals, and must remove at least three-fourths of the stomach to obtain good results. If it is a failure, further surgical treatment is usually not advised.

These details, although highly important, have less significance than the end results, and the best evidence comes from the statements of the patients themselves. Follow-up studies of night secretions and gastric acidity, roentgen data, response to insulin and histamine tests, etc., are of scientific interest and help especially in analyzing the failures following any gastric operation. However, if the patient continues to be completely sa

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Read at the Seventeenth Annual Congress of the United States and Canadian Sections, International College of Surgeons, Chicago

Submitted for publication Sept. 9, 1952.

*Excludes the two postoperative deaths from the 170 studied.

During recent years at our hospital, from 15 to 20 per cent of the patients treated by the medical service for duodenal ulcer have been referred for surgical intervention. More than one indication for operation existed in many of these patients. Approximately 65 per cent had pain as the prime indication, while 24 per cent stated that they had had at least one episode of bleeding and 11 per cent showed clinical and roentgen evidence of pyloric obstruction. The duration of symptoms was more than three years in 72 per cent of cases, and in 12 per cent surgical closure of at least one perforation had been done.

We have been able to follow 170, or 93.4 per cent of the 182 patients on whom subdiaphragmatic vagotomy with gastroenterostomy was performed for duodenal ulcer from six months to five years earlier by one of us (C. C. G. or C. Y. W.).

These 170 patients were all thought to be suffering from duodenal ulcer, and definite evidences of ulcer were noted at operation in 163. None had undergone any previous definite gastric operation.

During the same period we have performed a somewhat smaller number of other gastric operations, including resection for duodenal and gastric ulcers, resection of stomal ulcers and pyloroplasties, and often have included vagotomy with various resections. The patients in this group, however, are not considered here.

The follow-up on these 170 patients has been done by personal interviews, by studies in the hospital, or by means of the following questionnaire:

> We are making a study of some patients treated at this hospital for peptic ulcer and are very much interested in your case. We hope the operation performed on . . (date) . . has been successful, and would like your frank reply to the following questions concerning your condition at the present time. Please answer on this letter and return it in the enclosed envelope. Feel free to make any additional comments you wish.
>
> 1. Do you now have pain? Yes. . . .No. . . . If you have pain of any kind, please describe it, and state if it is relieved by food or alkalies.
> 2. Do you now have any sensation of bloating or swelling in the abdomen after meals? Yes. . . .No. . . .
>   If yes, would you consider it (a) Mild . . . . (b) Moderate. . . . (c) Severe. . . .
>   (A) How often do you have it?
>   (B) What makes it better or worse?
>   (C) Are you a slow or rapid eater?
> 3. Do you belch gas from your stomach.? Yes. . . .No. . . .
>   If yes, please describe the nature and frequency of such belching and tell whether or not there is any odor to your breath.
> 4. Are your bowel habits normal? Yes. . . . No. . . .
>   If not, please describe.
> 5. Have you needed any treatment for your ulcer since operation? Yes. . . .No. . . . If so, please describe it.
> 6. Are you eating a general diet? Yes. . . . No. . . . If not, what foods do you avoid and why?
> 7. What was your average weight before operation? . . . .lbs.
>   Your present weight?. . . .
> 8. Would you consider the result of your operation: (a) Excellent. . . . (b) Good . . . . (c) Fair. . . . (d) Poor. . . .
>
> We will be glad to have any comments which you may care to make. Please use the back of this sheet for this purpose.
>
> Thank you very much for this information. We hope it will be helpful in treating other patients with peptic ulcers.

Seventeen, or 10 per cent, of the 170 patients have unsatisfactory results, including 2 postoperative deaths. All of the 15 living patients known to have poor or only fair results have been restudied, and an attempt has been made to analyze the failure of the operation. Twelve patients could not be followed and are not included in this series.

The results with these 170 patients have been critically reviewed and the following divisions made:

	No. of Patients		*Per Cent*
Excellent	115	67.6	90% satisfactory
Good	38	22.4	
Fair	11	6.5	10% unsatisfactory
Poor	6	3.5	

"Excellent" means that the patient is essentially normal in gastrointestinal function, has no pain, eats a general diet, requires no medication and is completely satisfied with the operation. A "good" result means a satisfied patient, free of pain and requiring no treatment but complaining occasionally of some diarrhea, bloating, "gas" or inability to eat certain foods. A "fair" result means that relief of pain has been achieved but definite limitations in diet are necessary. In this group have been placed those patients who have some distressing diarrhea, have had black stools at least once or have required medication at times. Some of these patients consider the result of their treatment satisfactory, because of the relief of pain. The "poor" results are those observed in patients who have shown no improvement or show other symptoms which are disabling, and are unhappy with the result. We use the term "unsatisfactory" when the condition of the patient is fair or poor and feel that there is justification for a distinction between "good" and "fair" results. We agree with Walters[1] and his co-workers, that a thorough postoperative study of a patient may obtain information not forthcoming in a questionnaire, and may show that the result is not as good as the patient thought it to be. We have found the opposite also to be true, and later studies on several patients have revealed other pathologic processes, such as cholecystitis, diverticulitis of the colon and subacute or recurring appendicitis, to be the explanation of symptoms ascribed by the patient to a poor result of the previous operation. Walters[1] stated that 89.2 per cent of patients traced by questionnaire reported excellent results after vagotomy and gastroenterostomy for duodenal ulcer, whereas of 44 patients who returned for study only 75 per cent had excellent results, 13.6 per cent had "unsatisfactory" results and 11.4 per cent had poor results. Of the 170 patients we have followed, 68, or 40 per cent, have been restudied, and 102, or 60 per cent, have responded by questionnaire. In this series are included private patients (about 20 per cent) and contributors to the Illinois Central Railroad Hospital Department (80 per cent). The latter may return to the hospital for restudy at no added expense to themselves, and the great majority do return if they are dissatisfied with the results of any operation. Our results have been the same in the follow-up of private patients as those obtained by follow-up of railroad employes.

The 2 patients who died (1 per cent of our entire series to date) were studied at autopsy. One, a 56-year-old man, died of acute coronary thrombosis four days after the operation. The other, a man 47 years old, left the hospital eight days after the operation in good condition, and returned three days later with enormous gastric retention and alkalosis. He responded promptly to treatment, but again alkalosis with uremia developed, and he died fourteen days after the operation. Postmortem examination failed to supply an adequate explanation for his death. There have been no deaths in the last group of 170 patients, operated upon from November 1948 to the time of writing.

Other major postoperative complications were:

Wound disruption	4	
Pneumonia or atelectasis	3	
Stomal obstruction requiring reoperation	2	
Thrombophlebitis	2	
Pneumothorax	1	
Coronary thrombosis	1	
Wound infection	1	
Total	14	(7 per cent of total series)

Seven patients have had symptoms suggesting a stomal ulcer, and all have been restudied. In only 1 has an ulcer been revealed by roentgen examination, and the patient is chronically alcoholic. He was reoperated on, and a subtotal resection was performed. Reoperation was advised for 1 other patient but was refused. We agree with Stempien and his associates[2] that gastritis may develop after gastroenterostomy and that this may account for symptoms in the absence of actual ulceration.

We also realize that stomal ulcers may be difficult to demonstrate roentgenographically.

Diarrhea has occurred in about 15 per cent of our patients, but in only 3 has it been severe and persistent enough to cause the result to be listed as fair or poor. In most of the patients with postoperative diarrhea the condition has subsided or disappeared within two or three months. Several patients stated that they had several bowel movements daily, but were well satisfied because they had previously been troubled by constipation.

Seven of the 15 living patients listed as showing fair or poor results were definitely psychoneurotic or had a "gastric neurosis." In the group with excellent or good results there were 4 patients with neurotic manifestations and proved duodenal ulcers. We and others[3] have learned to beware of operating on neurotic persons, especially if there is any question as to the presence of an ulcer on roentgen examination. One extremely neurotic male patient had a long list of various abdominal and other complaints both before and after vagotomy and gastroenterostomy for a proved ulcer. He was recently urged to undergo gastric resection at another clinic, but refused. We have listed him as showing a poor result, although he is markedly improved since he has quit smoking. He was consuming two to three packages of cigarettes daily at the time resection was advised.

Five patients have had some bleeding from the upper part of the gastrointestinal tract since the operation. One is believed to have bled from a hiatus hernia observed at operation and since demonstrated by roentgen ray. He considers the surgical result satisfactory, as he is entirely free of pain and takes a general diet.

We have had no patients in whom a hiatus hernia is known to have developed after the operation. There would seem to be no reason why such a hernia should develop if the operation is properly done. Six patients had prolonged faulty postoperative functioning of the gastroenterostomy. Two required reoperation with refashioning of the stoma, and 1 of these has been followed and has an excellent result.

In 7 patients no evidence of ulcer could be found at operation, but vagotomy and gastroenterostomy were performed because the history or roentgen picture, or both, seemed diagnostic. The results were unsatisfactory in 2 cases (28.6 per cent).

From previous experience with gastroenterostomy alone, it is well recognized that a long follow-up period is advisable for accurate appraisal of results. This may also be true of vagotomy with gastroenterostomy, although our follow-up studies indicate that the great majority of unsatisfactory results become apparent within the first one or two years. We have compared the time that our patients have been followed with their status at present, and it is noteworthy that the percentage of satisfactory results after four years is essentially the same as within the first two years.

	No. of Patients Followed	*Excellent or Good Results*		*Fair or Poor Results*	
6 months to 2 years	83	75	90.4%	8	9.6%
2 to 3 years	47	43	91.5%	4	8.5%
3 to 4 years	18	17	94.4%	1	5.6%
4 years and over	20	18	90 %	2	10 %
Total*	168	153	91.1%	15	8.9%

The weight of the patient appears to have little significance in relation to his postoperative condition. A substantial loss of weight is reported by the majority of these dissatisfied with the operation:

Weight Status, Postoperative	*Excellent or Good*	*Fair or Poor*
Weight maintained or increased	99	6
Weight lost (5 pounds or more)	54	9

Studies of gastric acidity have not been attempted routinely by us as regards responses to insulin or histamine tests.

Repeated postoperative titrations of free hydrochloric acid from gastric aspirations have been recorded in 111 of the patients followed. These are correlated with the duration of follow-up and the results.

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*Excludes the two post-operative deaths from the 170 studied.

Postoperative Free Hcl	*Results 6 Months to 2 Years Excellent or Good*	*Fair or Poor*	*2 years plus Excellent or Good*	*Fair or Poor*
0- 5 units	52	2	24	3
6-10 units	6	1	3	0
11-15 units	4	0	1	0
16 plus	5	2	4	4
Total	67	5	32	7

This table is subject to criticism. The influx of alkaline intestinal contents into the stomach after gastroenterostomy can unquestionably affect the accuracy of any conclusions as to free acid secretion. It is known that free acid may reappear after an initial postoperative period of anacidity. This series would indicate that, of 99 patients with satisfactory results, approximately 86 per cent had postoperative free hydrochloric acid levels of 10 units or less, while 12 patients with unsatisfactory results only 45 per cent had low acid recordings. The complete absence of free acid after the operation is certainly not necessary for a good result.

We do not recommend vagotomy and gastroenterostomy for gastric or pyloric ulcers, although on 4 occasions we have performed this operation on patients with large, very high-lying ulcers of the lesser curvature that appeared on direct visualization (through gastrotomy incisions) to be benign. Almost total gastrectomy was the only alternative. Three of these have been followed and are entirely well. They are not included in this series of cases.

We have not attempted to review those of our patients on whom gastric resection has been performed for duodenal ulcer. There have been relatively few of these in recent years. Formerly we feared recurrent hemorrhage after vagotomy with gastroenterostomy in patients with a history of a bleeding duodenal ulcer. This fear has proved unfounded. Gastric resection is now employed by us as a primary operation for duodenal ulcer only when there is active or very recent excessive bleeding, usually from a large ulcer of the posterior wall eroding into the pancreas.

During the five years covered by this study, no change has been made in the technic of vagotomy and gastroenterostomy. The left lobe of the liver is not freed from its attachment to the diaphragm. The vagus nerves and filaments are located by palpation after the esophagus has been put on the stretch. The nerves are pulled down from the mediastinum and 6 to 10 cm. of each is resected, without ligation. A retrocolic gastroenterostomy is placed at what appears to be the most dependent portion of the stomach, and the stoma is fashioned to extend diagonallly from near the lesser to the greater curvature and from the patient's right to his left. The distal or efferent portion of the jejunum is attached at the greater curvature and extends well to the left. The left of the proximal or afferent loop is 2 to 6 inches (5 to 15.2 cm.), depending on the obesity of the mesocolon. The stoma averages 2 inches (5 cm.) in length and is made somewhat longer in patients with some degree of obstruction. Two rows of continuous chromic No. 00 catgut sutures and an external row of interrupted No. 40 cotton sutures are used.

Our postoperative management after vagotomy with gastroenterostomy consists of continuous gastric suction for three days, during which time daily intravenous infusions include 500 to 1,000 cc. of 5 per cent dextrose in physiologic solution of sodium chloride and 2,000 cc. of 5 per cent dextrose in water. Amino-acid preparations are seldom used. To the dextrose are added Vitamins B and C (500 mg.). Potassium is given when gastric suction is continued over three days. The amount of fluid given varies somewhat with the size of the patient, the urinary output and the weather. In [illegible] per cent of patients gastric s[illegible]nstituted for a day or two [illegible]t postoperative week. A[illegible] the patients [illegible] liquids per hour for the first day, 2 ounces the second and 3 or more the third, with jello, cereals and custards. Five small daily feedings are then given. The majority of patients are discharged from the hospital by the tenth or twelfth day with instructions to adhere to a bland diet including chicken and fish and to limit the size of their feedings. By the third or fourth week meat is added, and by the sixth to eighth week they are allowed a general diet, although large meals are prohibited for the first three months. Many patients are so delighted with their freedom from pain and their ability to eat anything that they tend to overeat, and this may result in bloating or even vomiting. Very few patients who follow instructions have any difficulties. Light work can be resumed by most patients in four to six weeks after the operation and heavy work in six to eight weeks.

The euphoric state of the majority of these patients is clearly shown in the enthusiastic letters and comments received. To a large extent these patients constitute the most satisfied group we encounter after any operation for any disorder. Their enthusiasm for the results is not matched by the reports of those on whom subtotal resection has been performed. Radical resection usually relieves pain, but a large percentage of the patients never return to a general diet and have other gastric complaints.

Time and proper case appraisals will eventually give the answer to the relative merits of these two operations for duodenal ulcer. Jordan[4] reported that there are approximately the same number of satisfied patients after each operation, but her combined statistics show 5 to 12 per cent better results after resection. Crile and others,[3a] in a series of 147 patients comparable to ours, have recently reported 90 per cent of satisfactory results after vagotomy and gastroenterostomy. Dragstedt[5] reported 87 per cent of good results and admitted that failure to effect complete vagotomy is the chief weakness of the operation.[6] In his opinion, complete vagotomy abolishes the nervous or cephalic stimulation for hypersecretion of hydrochloric acid in 97 per cent of patients. Stein and Meyer[7] reported that the effects of complete vagotomy persist for at least three to four years, and that both resection and vagotomy depress all the mechanisms of gastric secretion, although by different means.[8] The results after gastric resection vary with different authors. Healy, Hellman and Sauer[9] compared resection with vagotomy alone, as others[10] continue to do; although there now remains no doubt that vagotomy should always be combined with some type of drainage procedure in the treatment of duodenal ulcer. After resection Healy observed dumping syndromes in 10 per cent of cases, demonstrable marginal ulcers in 5.8 per cent and recurrent bleeding in 13.6 per cent. His overall evaluation indicated that 90.8 per cent of patients improved after resection for duodenal ulcer. Others[7,9] have reported much poorer results from resection. The mortality from resection in the best hands will average 1 to 3 per cent,[11] although much lower figures are recently recorded.[12] As Crile[4] and others[3a] have pointed out, it is unfair to compare resection done on "good risks" with vagotomy and gastroenterostomy when the latter operation is reserved for "poor risks" or performed only when definite ulcer is not present and a more radical procedure does not seem justified.

In our opinion, the evidence is gradually accumulating that vagotomy with gastroenterostomy will give as good long term results as elective subtotal gastric resection, or better, in comparable series of patients with duodenal ulcers.

SUMMARY

One hundred and seventy patients were subjected to vagotomy and gastroenterostomy for duodenal ulcer and have been followed for six months to five years. Of these, 153, or 90 per cent, show satisfactory results; 17, or 10 per cent, show fair or unsatisfactory results.

There were 2 deaths, a surgical mortality rate of 1 per cent in a total of 201 patients. There have been no deaths among the last 170 patients (this group includes patients operated on in the last six months). Three, or 1.7 per cent ,have disabling diarrhea.

Only 1 proved stomal ulcer has occurred, although 7 were suspected. Five patients, or 2.8 per cent, have had postoperative bleeding. Of 7 patients in whom no ulcer was discovered at operation, 5, or 2.8 per cent, show unsatisfactory results.

Psychoneurotic patients and patients with questionable ulcers are poor candidates for surgical treatment.

CONCLUSIONS

Vagotomy with gastroenterostomy will give as good end results as subtotal resection in comparable patients with duodenal ulcers. It has the further advantages of *requiring less time to perform, carries a* lower surgical mortality, and permits later resection if it proves a failure.

CONCLUSIONI RIASSUNTIVE

170 malati sono stati sottoposti a vagotomia e gastroenterostomia per ulcera duodenale e sono stati seguiti per un periodo vario da 6 mesi a 5 anni; 153 di essi (90% hanno ottenuto un buon risultato, 17 (10%) risultati cattivi.

Ci furono 2 morti, con una percentuale dell '1% su un totale di 201 pazienti. Nessun decesso negli ultimi 170 casi (il gruppo comprende anche gli operati negli ultimi 6 mesi). Tre pazienti (1,7%) hanno presentato una diarrea grave. In un caso è stata dimostrata la comparsa di un 'ulcera peptica, in altri 7 ve ne fu il sospetto; 5 pazienti (2,8%) ebbero emorragie post-operatorie. Nei 7 casi in cui non si trovò ulcera all 'intervento si ebbero 5 risultati cattivi (2,8%).

I soggetti psiconeurotici e i pazienti con ulcere discutibili sono cattivi candidati alla cura chirurgica.

La vagotomia con gastroenterostomia può dare disultati altrettanto buoni come la resezione subtotale. Presenta, tuttavia, il vantaggio di una maggior brevità di intervento, è gravata da una più bassa mortalità operatoria e consente una resezione in secondo tempo qualora non sia stata efficace.

RÉSUMÈ

170 patients atant subi une vagotomie avec gastro-entérostomie pour ulcère duodénal ont été suivis pendant 6 mois à 5 ans. Parmi ce monde, 153 ou 90% éprouvèrent d'heureux résultats; 17 ou 10% ne furent pas soulagés. Sur 201 patients, il y a eu 2 morts. Aucune mortalité dans le groupe des 170. Les patients souffrant de psychoneurose et ceux dont l'ulcère n'était pas certain, ne furent pas de bons candidats. Les auteurs recommandent le traitement pour l'ulcère duodénal. Ils se basent sur leurs statistiques post-opératoires.

RESUMEN Y CONCLUSIONSES

Ciento setenta pacientes fueron sometidos a vagotomía y gastroenteroanastomosis para úlcera duodenal, habiendo sido seguidos de seis meses a cinco años. De estos 153, ó sea al 90 por ciento mostraron resultados satisfactorios; 17, ó sea el 10 por ciento mosraron resultados insatisfactorios.

Hubieron 2 muertes y una incidencia de mortalidad de 1 por ciento en un total de 201 pacientes. No han habido muertes *entre los ultimos 170 pacientes [grupo que* incluye pacientes operados en los ultimos seis meses]. Tres, ó sea el 1.7 por ciento tuvieron diarrea que produjo incapacidad. Unicamente se produjo 1 úlcera anastomótica probada, aún cuando se sospecharon 7. Cinco pacientes, o sea 2.8 por ciento tuvieron sangrado postoperatorio. De 7 pacientes en lo cuales no se descubrió úlcera en la operación, 5, ó sea el 2.8 por ciento, mostraron resultados insatisfactorios.

Los pacientes psiconeuróticos y pacientes *con úlceras dudosas son malos candidatos* para el tratamiento quirúrgico.

La vagotomía con gastroenteroanastomosis, da tan b [illegible] resultados co [illegible] la

resección subtotal en pacientes comparables con úlcera duodenal. Tiene la ventaja de que requiere menos tiempo para realizarse, implica una mortalidad quirúrgica menor y permite ressección posterior si es un fracaso.

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

Hundertsiebzig Kranke wurden wegen Zwölffingerdarmgeschwürs der Vagatomie und Gastroenterostomose unterzogen und für einen Zeitraum zwischen sechs Monaten und fünf Jahren beobachtet. Von diesen Kranken zeigten 153, d.h. 90%, befriedigende Resultate und 17, d.h. 10%, unbefriedigende.

Es kamen zwei Todesfälle vor, d.h. die chirurgische Mortalität betrug 1% bei einer Gesamtzahl von 201 Kranken. Unter den letzten 170 Kranken (diese Gruppe schliesst die in den letzten sechs Monaten operierten ein) befanden sich keine Todesfälle. Drei Kranke, d.h. 1,7%, leiden unter einer entkräftenden Diarrhoe. Nur in einem Fall konnte ein Geschwür am Stoma nachgewiesen werden, obgleich ein Verdacht in sieben Fällen bestand. Fünf Kranke, d.h. 2,8%, zeigten postoperative Blutungen. Von sieben Kranken, an denen bei der Operation kein Geschwür gefunden werden konnte, zeigten fünf, d.h. 2,8% der Gesamtzahl, unbefriedigende Resultate.

Psychoneurotische Kranke und solche, bei denen die Geschwüre fraglich sind, sind undankbare Kandidaten für die chirurgische Behandlung.

Die Vagotomie mit Gastroenterostomose ergibt gleich gute Resulate wie die subtotale Magenresektion, wenn vergleichbare Kranke mit Zwölffingerdarmgeschwüren operiert werden. Die Methode hat ferner den Vorteil, dass ihre Ausführung weniger Zeit erfordert, dass ihre chirurgische Sterblichkeit niedriger ist, und dass, wenn sie erfolglos ist, der Weg für eine spätere Resektion noch offen bleibt.

SUMÁRIO E CONCLUSÕES

170 doentes foram operados de vagotonia e gastro-enterostomia por ulcera duodenal, os quais foram observados de seis mêses a cinco anos pelos autêres. Dêles, 153 ou sejam 90%, ofereceram resultados satisfatóries; 17, ou 10%, apresentaram resultados desfavoraveis.

A cifra de mortalidade cirúrgica foi de 1% uma vez que foram registradas duas mortes num total de 201 doentes operados, não se registrando qualquer óbite nas ultimas 170 operações. Três, ou sejam 1,7% tiveram diarréia. Em apenas um caso ficou provada a existencia de ulcera gastrica, sendo que em sete doentes houve suspeita. Cinco apresentaram complicações posoperatórias, oferecendo assim a porcentagem de 2,8%. Nos sete casos em que não se positivou afetivamente a existencia re ulcera gastrica não se poude constatar bons resultados operatórios.

Não é bem indicado o tratamento cirúrgico, frizam os autêres, aos psiconeuróticos e aos doentes com ulcera discutivel.

A vagotônia acempanhada de gastroenterostomia dará tão bom resultado quanto a gastrectomia sub-total nos doentes portadôres de ulcera duodenal. Apresenta ainda as vantagens de sêrem mais rapidamente executadas, oferecerem menor taxa de mortalidade circúrgica, e, permitirem uma posterior resseção do estomaga no caso de vir sêr provada a sua ineficacia.

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Acute Necrotizing Pancreatitis and Lower Nephron Syndrome Following Transurethral Prostatic Resection

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THE occurrence of acute pancreatitis unassociated with operation on the biliary tract but associated with operation on some other organ is a rare phenomenon. The case here reported is the fourth to be recorded in the world literature. In the first 2 cases, operation on the prostate (transurethral prostatectomy) resulted in nonhemorrhagic pancreatitis and the lower nephron syndrome.

The outstanding pathologic condition in the case reported here clearly parallels that of the former reports, except for the interval in time; in this case the disease manifested itself on the tenth postoperative day, while in the former reports it was said to have occurred at the time of operation. Our purpose in reporting the case is to contribute to the further pursuit of the probability that a common etiologic factor exists, initiating both pancreatitis and the lower nephron syndrome.

REPORT OF CASE

A white man aged 68 was admitted to the urologic service of Drs. Wilkey and Barson at Columbus Hospital on Nov. 5, 1950. The chief complaints were frequency of urination with nocturia (3 to 5 times), of one year's duration; dysuria for the past week and a half, and loss of 20 pounds (9.1 Kg.) of weight in three weeks.

The past history and a systemic review revealed no abnormality beyond the urologic data just described. Catheterization after urination disclosed 6 ounces (170 cc.) of residual urine.

Physical examination showed the patient to be well developed and well preserved. He did not appear acutely or chronically ill. The temperature was 98.4 F.; the pulse rate 100; the respiratory rate 22, and the blood pressure, in millimeters of mercury, 130 systolic and 75 diastolic. Rectal examination revealed benign prostatic hypertrophy, Grade II.

On admission the blood contained 3,520-000 red cells and 7,350 white cells per cubic millimeter, with 81 per cent hemoglobin. Urinalysis yielded the following values: specific gravity, 1.018; albumen, absent; sugar, 1 plus; acetone, absent; leukocytes, few; epithelial cells, few; crystals, few (oxalate). The Kahn test gave a negative result.

Chemical studies of the blood revealed 36 mg. of nonprotein nitrogen, 1.15 mg. of creatinine and 118 mg. of sugar per hundred cubic centimeters. An electrocardiogram showed left axis deviation and was also compatible with some myocardial damage.

Roentgen examination of the abdomen revealed (a) degenerative arthiritis of the lower part of the spine and (b) arteriosclerosis.

Course in the Hospital.—Subsequent urinalyses failed to reveal sugar, and the patient was given triple sulfa and penicillin prior to operation.

Transurethral resection of the prostate was performed on November 10, with the patient under intravenous sodium pentothal-nitrous oxide anesthesia, 30 Gm. of prostatic tissue being removed. The total procedure lasted twenty minutes. The irrigation fluid employed was 1.87 per cent glycine (amino-acetic acid) solution.

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Submitted for publication Aug. 25, 1952.

During the operation there was no fluctuation in blood pressure, which remained at 130 systolic and 60 diastolic. The pulse rate increased from 95 to 105 at the termination of the operative procedure, and the patient's postoperative condition was considered good.

The immediate postoperative course was uneventful. The pulse rate and temperature were normal except for one slight elevation of the latter on the third postoperative day, when it rose to 101 F. with a pulse rate of 82, and thereafter remained normal. The Foley catheter was removed on November 15, the fifth postoperative day, and the patient urinated spontaneously and with ease. The urine was clear.

The remainder of the convalescence was uneventful until November 20, the tenth postoperative day, when the nurse noted at 10 a.m. that the patient's speech was somewhat confused and incoherent. At noon he complained of loss of appetite and extreme pain in the epigastrium and manifested generalized muscle spasm and excessive bleeding. The temperature was 98 F. and the pulse rate 120. The blood pressure in millimeters of mercury was 155 systolic and 90 diastolic. Emergency chemical tests of the blood on the same day revealed the following values: urea nitrogen, 70.3 mg., and creatinine 19.3 mg., per hundred cubic centimeters; carbon dioxide combining power, 50.4 volumes per cent.

A Foley retention catheter was immediately inserted, the patient sedated, and 1:6 M lactate solution started intravenously.

The patient's course was steadily downward, the muscle spasms becoming more frequent and of longer duration. There occurred a bloody emesis, and subsequently only scanty, bloody urine was produced.

On November 21 the same muscular spasms continued, and anuria developed and was treated with (a) 250 cc. of 10 per cent dextrose in water, (b) 250 cc. of plasma and (c) 1,000 cc. of 1:6 lactate solution. At 10:30 p.m. a small amount of bloody urine was passed via the catheter. The pulse rate remained at 112 beats per minute, and the temperature throughout the day was 98.6 F.

Chemical tests of the blood on the same day revealed 191 mg. of nonprotein nitrogen and 18.5 mg. of creatinine per hundred cubic centimeters.

On November 22, the patient's condition worsened, with projectile vomiting of bloody fluid and the passage of blood through and around the retention catheter. The muscle spasms were continuous, and the patient died at 7 p.m. on the twelfth postoperative day.

Autopsy.—Gross Observations: The pancreas weighed 10 Gm. There were areas of [illegible] and white areas about the middle port[illegible] jacent to the vessel. No ch[illegible] were [illegible] in either the head or the t[illegible] of the p[illegible] On cut section the [illegible] was [illegible] grey.

The right kidney [illegible] 240 Gm. Both were [illegible] The markings [illegible] ves conta[illegible] areas were [illegible] seem to be [illegible] were not [illegible] stripped away [illegible] surface.

The bladder was filled [illegible] pletely clotted blood [illegible] the urethra. The part [illegible] from the urethra was 2 inches [illegible]

Microscopic Observation: The [illegible] showed extensive necrosis, w[illegible] There was dense neutrophilic exud[illegible] proteolysis. Acute pancreatit[illegible] (Fig. 1).

In the kidney, cloudy swelling and granular degeneration of the convoluted tubules were observed. Many of the cells in Henle's loop were devoid of nuclei. The veins were engorged with erythrocytes, some of which were undergoing degenerative change. In some areas there was precipitated albuman in Bowman's capsule (Fig. 2).

COMMENT

As may be seen from the foregoing case report, the onset of pancreatitis and acute renal shutdown became apparent on the same day, after a relatively uneventful ten-day postoperative period. Since muscular twitchings were evident prior to the onset of epigastric pain, it must be assumed that the lower nephron syndrome antedated the pancreatitis, but the presence of a common etiologic agent seems more than coincidental.

It is known that the prostatic parenchyma has a high proteolytic enzyme index and that during transurethral resecti this enzyme may be released into the ge

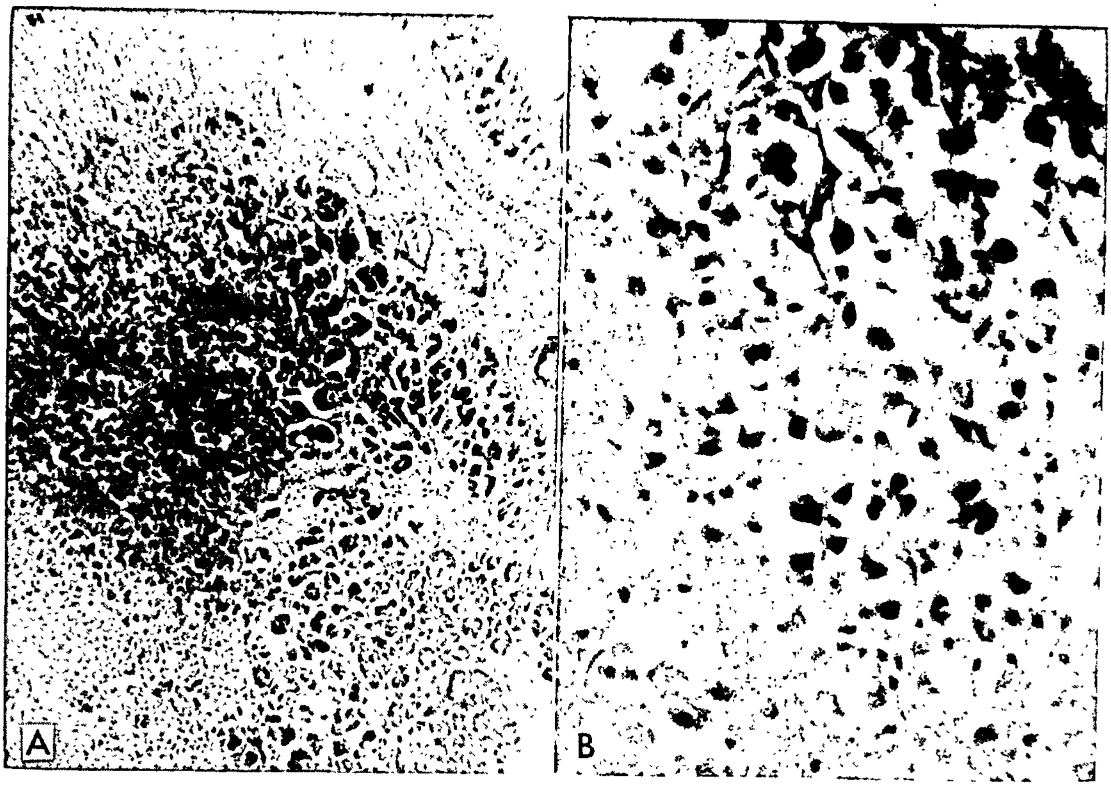

Fig. 1.—Photomicrograph of pancreas. *A*, pancreatic necrosis. The lower part of the field shows normal pancreatic tissue. *B*, extensive pancreatic necrosis.

eral systemic circulation.[1] It is also known that one of these enzymes when released may affect both the lower kidney nephrons and also the pancreas,[2] producing a joint syndrome such as was observed in this case.

In transurethral resection, hemorrhage of greater or lesser degree is usually present, and hemorrhage itself may produce fibrinolysis,[3] not only by its direct action but by hemodilution, or rather plasma dilution, which in itself activates proteolytic enzymes.

The point of interest in this case is the probability that one or perhaps a combination of many proteolytic enzymes were responsible for the dual pathologic condition. That these enzymes were released can be readily accepted, but that the titre was great enough to produce such marked changes in the kidney and pancreas remains conjectural, since in this case the catastrophe occurred on the tenth postoperative day.

One may also consider the possibility of sensitization of these two vulnerable organs to repeated attacks of the enzymes, with final calamity as the end result. This case report only adds food for thought in that such enzymes must be present, and one can only conjecture as to their pathologic role and mode of action.

Another point of interest in the case here reported was the time lag between operation and the onset of disease, which was ten days. It is a point of conjecture that, if the theory of proteolytic enzyme activity had been the etiologic basis, would it not have manifested itself prior to the tenth postoperative day? Or may it be explained by a period of latency or decreased tissue tolerance to activated enzymes? Certainly in this case the condition did not become manifest at the first onslaught, but yielded only after a long period of time.

SUMMARY

A case of acute necrotizing pancreatitis and lower nephron syndrome following transurethral resection is presented. The possibility of a common etiologic agent in the two pathologic conditions is considered and discussed. This is the fourth case report in the world literature.

RÉSUMÈ

Les auteurs rapportent un cas de pancréatite nécrosante associé à un syndrome de néphron distal survenu après une résection trans-uréthrale. Ce cas serait le 4e rapporté.

RIASSUNTO

Viene presentato un caso di pancreatite acuta necrotica con sindrome da nefrone inferiore consecutivo a resezione transuretrale. Viene presa in considerazione e discussa la possibilità che le due sindromi possano avere un comune agente etiologico. Il caso presentato è il quarto nella letteratura mondiale.

ZUSAMMENFASSUNG

Es wird ein Fall akuter nekrotisierender Pankreatitis und Nephrose ("lower nephron syndrome") im Anschluss an eine transurethrale Resektion beschrieben. Die Möglichkeit eines gemeinsamen ätiologischen Faktors für beide Krankheitszustände wird in Erwägung gezogen und

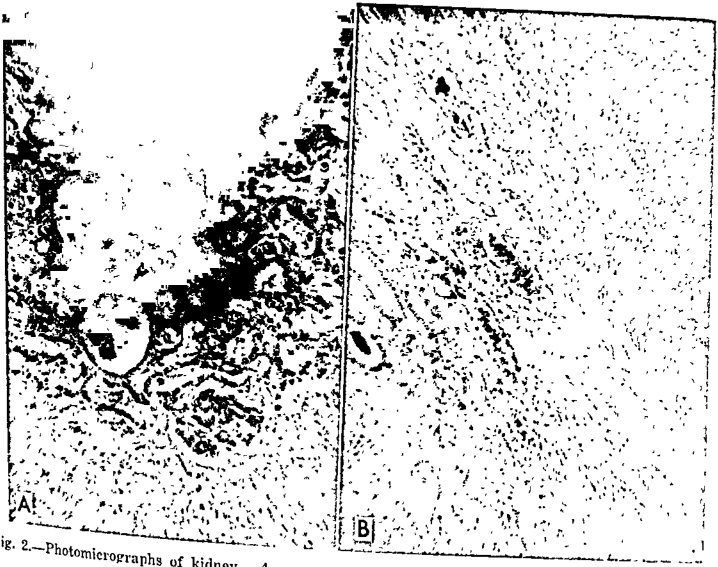

Fig. 2.—Photomicrographs of kidney. *A*, severe nephrosis of the convoluted tubules. *B*, hemoglobin casts in the tubules of the medullary zone.

erörtert. Es handelt sich hier um den vierten in der Weltliteratur berichteten Fall.

RESUMEN

Se presenta un caso de pancreatítis águda necrotizante y síndrome de nefrón inferior consecutivo a una resección transuretral. Se considera y discute en ambos procesos patológicos la posibilidad de un agente etiológico común. Se trata del cuarto caso comunicado en la literatura mundial.

SUMARIO

Um caso de pancreatite aguda necrozante é registrado, acompanhade de nefrose, em consequencia a uma resseção transuretral. A possibilidade de um agente etiologico comum a essas duas condições patologicas é estudada e discutida. É êsse o quarto caso registrado na literatura mundial.

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Use of Refrigerated Homogenous Bone

A Follow-up Study

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REFRIGERATED homogenous bone is being utilized more and more widely in orthopedic surgery. However, there are relatively few statistical analyses[1] proving its efficacy. It is the purpose of this paper to present the clinical results of our first 100 consecutive bone bank cases. The length of follow-up varies from four and a half to thirty-two months, with an average of sixteen months. All cases were followed until the fate of the graft was determined.

Method of Preservation.—Most of the bone was obtained from fresh amputations of the lower extremities for peripheral vascular disease. The bone was sectioned into appropriate sizes and preserved after the method of Bush and Garber[2]. In all instances the donors had normal serologic values, no history of malaria or jaundice, and no evidence of malignant disease or tuberculosis. Routine cultures were taken at the time the bone was obtained and again when it was used. Bone showing a "positive" culture was discarded. When more bone was present in one bottle than was needed in an operation, the excess graft was placed in another set of sterile bottles and returned to the bank. The bone was stored from five to three hundred days, with an average of eighty-one days.

Statistical Analysis.—This series included a wide variety of orthopedic procedures. Most of the patients received prophylactic doses of penicillin five to seven days after the operation. More than 90 per cent of the patients were male. Because general surgical and orthopedic residents performed the majority of the operations, there were about twenty operating surgeons in all. The average length of refrigeration of the graft in cases of failure was found to be ninety days, which, although it is somewhat higher than the overall average of eighty days, is not of statistical significance.

The results in the 100 consecutive cases are shown in the ten tables. Tables 1 through 5 present data concerning the type of bone graft employed. Tables 6 through 10 enumerate the types of surgical procedure followed. A comparison of the various types of bone graft is made in Table 1. In Table 2 the results of the onlay bone grafts are itemized. In several fresh fractures of the tibia, a homogenous bone graft was used instead of a plate as the primary means of internal fixation. In 6 cases, fractures of the forearm were treated successfully with onlay grafts, bearing out the observations of Knight and Purvis[3]. In these 6 cases the grafts were fashioned from portions of fibula. This appeared to be more appropriate than tibial bone, as it more closely approximated the dimensions of the bones of the forearm. In the cases of fracture of the humerus the graft was made from femoral shaft, as the curve of the circumference of the femur was found to fit snugly around the humerus. The femoral graft could be made to approximate almost one-third of the circumference of the humerus. This intimate contact of the graft with such a large surface of the humerus seemed very advantageous. The healing time was not influenced by the type of onlay graft, whether tibial, femoral or fibular.

The results of the inlay bone grafts are outlined in Table 3. This group includes those cases in which a portion of the bone graft projected into the medullary canal or into subcortical cancellous bone, such

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From the Orthopedic Service of the U. S. Public Health Service Hospital, Staten Island, New York.

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TABLE 1.—*Type of Bone Graft*

	No. of Cases	*Successes*	*Failures*
Onlay	22	21 (96%)	1 (4%)
Inlay	16	10 (63%)	6 (37%)
Cancellous	21	18 (86%)	3 (14%)
Cancellous and Cortical	41	32 (78%)	9 (22%)
Total	100	81 (81%)	19* (19%)

*Six of these were due to inadequate surgical handling.

TABLE 2.—*Onlay Bone Graft*

Site	*No. of Cases*	*Successes*	*Failures*
Tibia, old fracture	5	5	0
Tibia, fresh fracture	5	4	1
Femur	2	2	0
Humerus	3	3	0
Radius	3	3	0
Ulna	3	3	0
Metacarpal	1	1	0
Total	22	21 (96%)	1 (4%)

TABLE 3.—*Inlay Bone Graft*

Type of Case	*No. of Cases*	*Successes*	*Failures*
Fracture of femoral neck	2	2	0
Knee fusion	1	0	1*
Fracture tibia	1	1	0
Ankle fusion	1	1	0
Talus fracture	1	0	1
Medial malleolus fracture	4	4	0
Elbow fusion	1	0	1
Wrist fusion	1	0	1*
Carpometacarpal fusion	3	2	1*
Fracture of phalanx	1	0	1
Total	16	10 (63%)	6 (37%)

---

*These three failures were due to inadequate surgical management.

as a graft for a fracture of the femoral neck or a cortical bone peg for a fracture of the medial malleolus. The asterisks denote cases in which an experimental type of arthrodesis was performed. In the entire series there were 6 such arthrodeses, all of which failed. The method was discarded, as it was definitely concluded that the failures were due to inadequate surgical management rather than to a deficiency of the bone graft. These asterisks are present in several other tables; in each case they denote these arthrodeses. If the cases concerned were discarded from Table 3, the results would show 78 per cent of successes and 22 per cent of failures.

The cases in which only cancellous bone was employed are outlined in Table 4. This bone was usually obtained from the tibial or femoral condyles or, occasionally, from the tarsal bones. The grafts were fashioned into long "toothpick" strips of cancellous bone or ground into "meal."

Table 5 demonstrates the largest group of cases, those in which both cancellous and cortical bone were used. The cortical bone contributed to the stability, with cancellous bone supplying additional osteogenic material at the fracture site. In spinal fusions cancellous "meal" was often packed about a cortical H graft.

Tables 6 through 10 outline the cases with reference to the type of surgical procedure. Table 7 shows again that there has

TABLE 4.—*Cancellous Bone Graft*

Type of Case	*No. of Cases*	*Successes*	*Failures*
Spinal fusion	3	3	0
Fracture radius	1	0	1
Carpometacarpal fusion	1	1	0
I.P. fusion	5	3	2
Fracture phalanx	2	2	0
Enchondroma phalanx	1	1	0
Ankle fusion	1	1	0
Triple arthrodesis	7	7	0
Total	21	18 (86%)	3 (14%)

TABLE 5.—*Cancellous and Cortical Bone Graft*

Type of Case	*No. of Cases*	*Successes*	*Failures*
Spinal fusion	23	21	2
Hip fusion	2	0	2
Knee fusion	3	0	3*
Shoulder fusion (tbc)	1	0	1
Wrist fusion	1	1	0
Triple arthrodesis	2	2	0
Fracture of tibia	5	5	0
Fracture of femur	2	2	0
Fracture of clavicle	2	1	1
Total	41	32 (78%)	9 (22%)

---

*These 3 failures were due to inadequate surgical handling.

been a tendency to treat fresh fractures with onlay grafts, thereby combining the benefits of internal fixation with those of a bone graft. Bone grafts for a variety of nonunions and delayed unions are listed in Table 8.

The spinal fusions are analyzed in Table 9. In cases of tuberculosis of the spine, the paravertebral or intervertebral abscess, if present, was decompressed through a transversectomy approach as described by Michele and Krueger[4]. It is my opinion that thorough evacuation of pus and necrotic material at the time of the arthrodesis was a large factor in obtaining healing in each case. It should be noted in Table 10, that 3 of the knee fusions were for Charcot knees, in which condition bony ankylosis is notoriously difficult to obtain.

TABLE 6.—*Type of Case*

	No. of Cases	*Successes*	*Failures*
Fresh fracture	10	9 (90%)	1 (10%)
Nonunion or delayed union	32	27 (85%)	5 (15%)
Spinal fusion ..	25	23 (92%)	2 (8%)
Joint arthrodesis ..	31	20 (65%)	11 (35%)
Filling of defect	2	2 (100%)	0 (0%)
Total	100	81 (81%)	19* (19%)

*Six of these were due to inadequate surgical handling.

TABLE 7.—*Fresh Fractures*

Site	*No. of Cases*	*Successes*	*Failures*
Tibia	6	5	1
Humerus	1	1	0
Ulna	1	1	0
Radius	1	1	0
Medial malleolus	1	1	0
Total	10	9 (90%)	1 (10%)

TABLE 8.—*Delayed Union; Nonunion*

Type of Fracture	*No. of Cases*	*Successes*	*Failures*
Neck of femur..	2	2	0
Shaft of femur	5	4	1
Tibia	10	9	1
Medial malleolus	3	3	0
Clavicle	2	1	1
Humerus	2	2	0
Radius	3	2	1
Ulna	3	3	0
Metacarpal	1	1	0
Phalanx	1	0	1
Total	32	27 (85%)	5 (15%)

TABLE 9.—*Spinal Fusions*

Type	*No. of Cases*	*Successes*	*Failures*
Low back pain.	13	11	2
Tuberculosis .	6	6	0
Fracture of vertebra ..	2	2	0
Spondylolisthesis	2	2	0
Cervical lesion	2	2	0
Total	25	23 (92%)	2 (8%)

TABLE 10.—*Joint Arthrodesis*

Site	*No. of Cases*	*Successes*	*Failures*
Hip	2	0	2
Knee	4	1	3
Ankle	2	2	0
Triple arthrodesis	7	7	0
Tuberculosis of shoulder	1	0	1
Tuberculosis of elbow . .	1	0	1
Wrist .	2	1	1
Carpometacarpal	5	4	1
I.P. joint	7	5	2
Total ..	31	20 (65%)	11* (35%)

*Six of these were due to inadequate surgical handling.

Complications.—Although there were 5 postoperative infections, in only 1 case did it seem that the graft might have been the causative factor. In 5 cases cultures taken at the time of grafting were reported as giving positive results. The organisms were nonpathogens in 3 cases, being staphylococcus albus or diphtheroids. In the other 2 cases, Staph. aureus was isolated. However, in none of these cases did infection develop.

In 1 patient with nonunion of a tibia a skin slough developed, owing to parallel skin incisions, and it was three months later before any bone involvement could be noted. In this case, and also in a case of skin slough in a triple arthrodesis, the bone involvement seemed to be secondary to the low-grade infection accompanying the skin slough. In another case, in which an onlay graft for a fractured tibia had failed, the patient was reoperated on year later for nonunion. No drainage occurred since the original operation cultures at the second operation sh Staph. aureus. This case is question

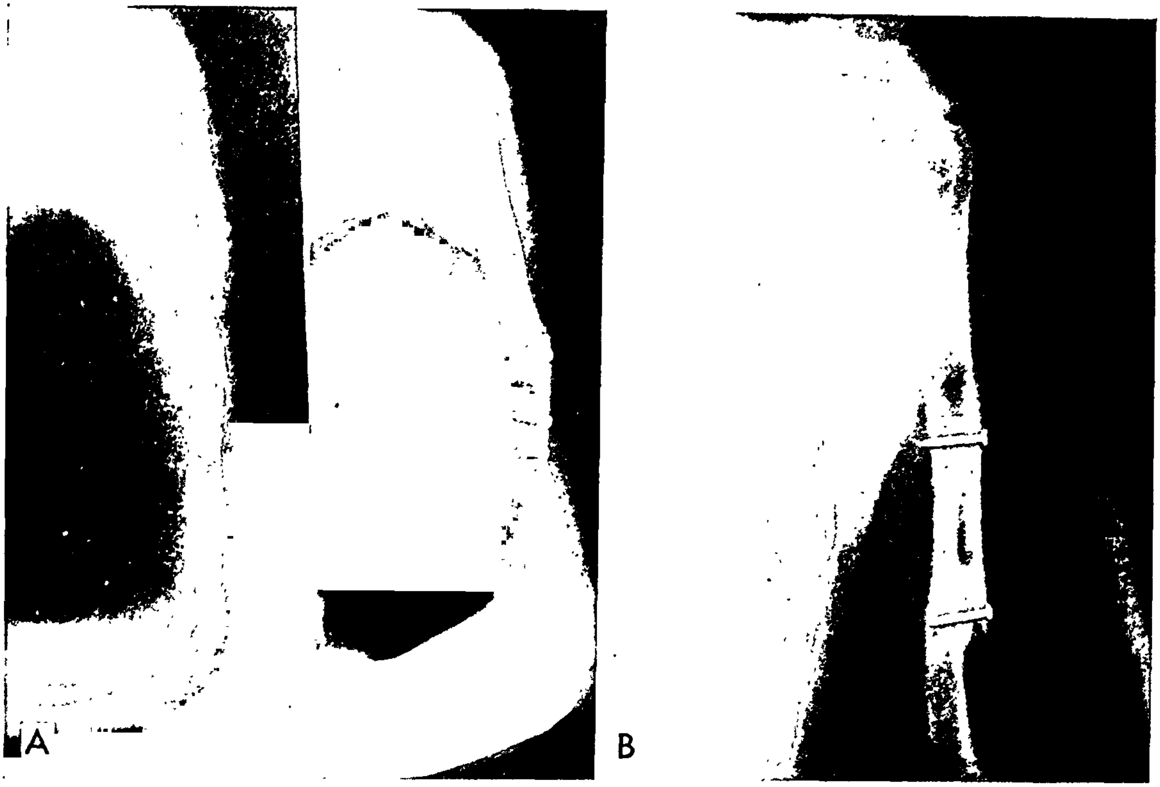

Fig. 1.—*A*, pseudoarthrosis of seventeen months' duration despite two autogenous tibial bone grafts. *B*, follow-up study (thirty-two months) after homogenous femoral onlay graft.

in that neither the history nor the physical signs were typical of postoperative osteomyelitis. In the last case there was an arthrodesis of the knee in which a large dead space was left at the time of operation. Some serous drainage occurred postoperatively, becoming purulent after five weeks. It was considered that the dead space had become infected secondarily. In 2 of the cases drainage continues, respectively one year and one and one-half years after the operation.

Two of the grafts fractured, 1 during casting in the operating room, the other a month after the operation, during a change of cast. One of the 2 patients healed despite the fractured graft; a successful regrafting operation was performed on the other at a later date.

Advantage of a Bone Bank.—After use of a bone bank for some time, numerous advantages become apparent:

1. The patient is spared a second operation to obtain bone for grafting (it is well known that operative defects at the donor site are often painful for a long time and sometimes weaken the bone enough to permit fracture to occur). The operative time is greatly shortened, and the danger of shock is lessened. For instance, this series includes almost a dozen arthrodeses of the metacarpals and phalanges. In such operations only a cubic centimeter of cancellous bone is needed, and the operation to obtain the graft from the ilium of neighboring areas is almost as time-consuming as the primary operation. These advantages are so apparent that further discussion is not needed.

2. Fortunately our bank has insured us of an adequate amount of cancellous and cortical bone at all times. As has been mentioned, this is a particularly important factor in the treatment of spinal fusions. In fact, there is a danger of using too much graft. In the case illustrated in Figure 2,

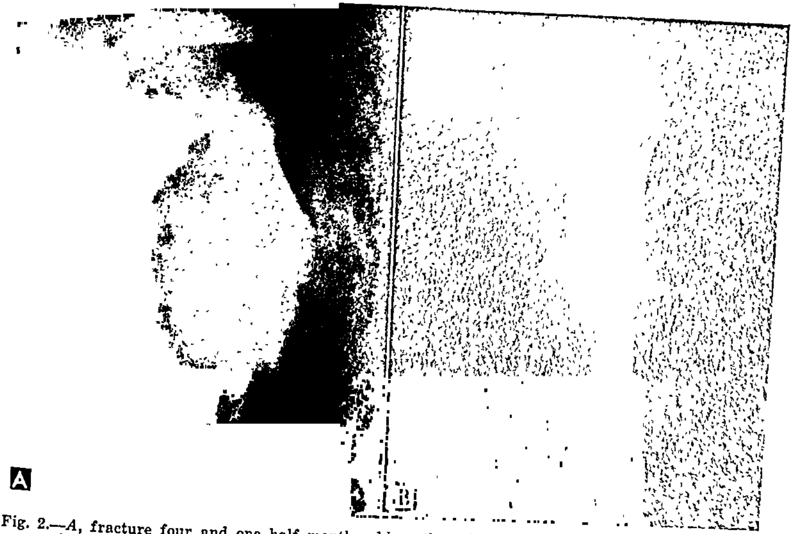

Fig. 2.—*A*, fracture four and one half months old, with malposition *B*, film taken three months after open reduction, H-S nailing and homogenous bone graft Note [illegible]

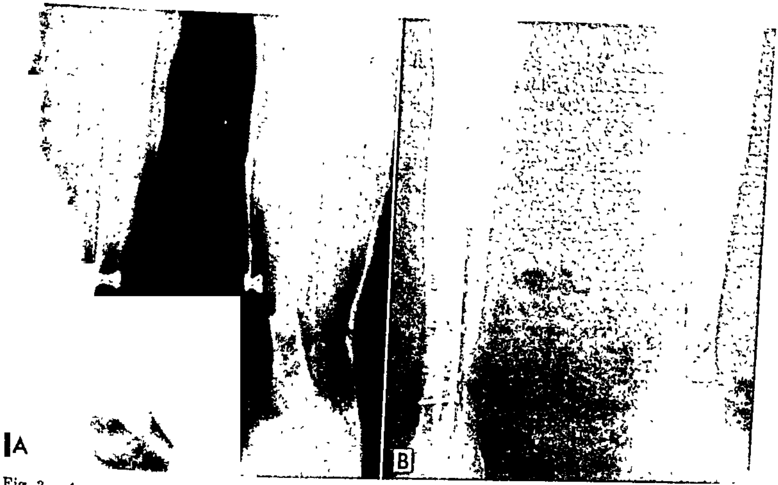

Fig. 3.—*A*, nonunion of compound fracture of the tibia and fibula of four months' duration, with soft tissue defect. *B*, bony union three months after onlay and intramedullary homogenous tibial grafts

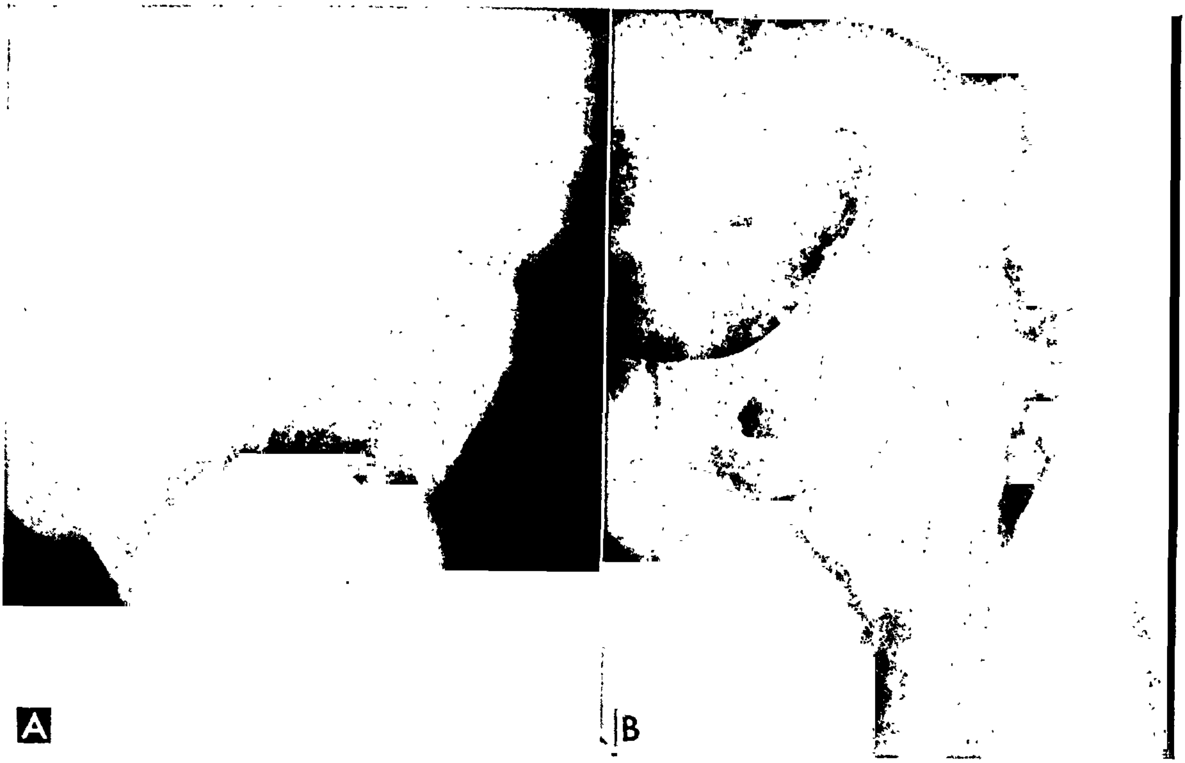

Fig. 4.—*A*, roentgenogram of a hip showing six-week-old fracture of neck of femur with complete anterior displacement of femoral head and proximal portion of neck with reference to distal fragment. *B*, film taken two years after open reduction, homogenous bone grafting and osteotomy.

A and *B*, an excess of graft was used and resulted in an excessively large callus.

3. New approaches to orthopedic problems are possible. For the past two years only one metal plate has been used for internal fixation, and this was used with cancellous bank bone to bridge a bone gap. At present primary internal fixation by cortical onlay grafts appears to be the treatment of choice for certain fractures, e. g., unstable fractures of both bones of the forearm. Recently, in cases of recurrent dislocations of the shoulder, especially when there were bony defects in the glenoid, the capsule has been riveted down to the glenoid with bone pegs. These pegs attach the capsule firmly to the glenoid and appear more physiologic than metal staples. Also, at the same time, they can be fashioned so as to make an anterior bone block if this is desired. It has become quite common to add a small amount of cancellous bone or thin cortical strips to any open reduction. This adds greatly to the bulk of the primary callus and appears to facilitate rapid healing.

Disadvantages of a Bone Bank.—1. Many authorities contend that refrigerated bone grafts are perhaps slightly slower to heal than are autogenous bone grafts. Although this is a very difficult thing to determine, it was not noticed, or at least was not obvious, in this series.

2. Unless cadaver iliac bone is used, the usual cancellous bone available to the bank is fatty cancellous bone, such as tibial condyle or tarsal bones. Some surgeons consider this inferior to red marrow iliac bone.

3. Early critics warned of the danger of infection due to the multiple handling of the bank bone. This has not been substantiated by this series or other series in the literature.[5]

SUMMARY

In this series of 100 consecutive homogenous bone grafts, the results were successful in 86 per cent of the cases (that is disregarding the 6 arthrodeses that failed because of inadequate surgery). Only 1 postoperative infection was considered to be secondary to the graft. Storage of the bone up to three hundred days did not appear to affect the success of the graft No difference in healing was noted between tibial, femoral or fibular onlay grafts. Each type had its own special advantages and indications, tibial for the lower extremity, fibular for the forearm and femoral grafts for the humerus. Meta plates have been replaced by cortical bone grafts at this hospital. Not only has a large amount of cancellous and cortica bone always been available, but having such a supply encourages the surgeon to devise new operative procedures.

With a look to the future, bone banks may follow blood banks in becoming standard equipment in large hospitals. Many orthopedic hospitals are somewhat isolated geographically and are often not too well integrated with general surgical services in which the majority of amputations are performed. Central bone banks should be started in the larger city institutions to obtain much such bone which is now being discarded. After sterile cultures have been obtained, the bone could be distributed to outlying districts and to city bone banks that are temporarily depleted.

SUMÁRIO

Numa serie consecutiva de 100 enxertias ósseas homogêneas, os resultados foram exclentes em 86% dos casos (isto é, sem considerar 6 artrodeses falhas por processos cirúrgicos inadequados aos respectivos casos). Apenas uma infecção posoperatória foi observada e considerada como secundaria ao enxerto. A conservação do ôsso acima de 300 dias não parece afetar o resultado da enxertia. Nenhuma diferença foi notada quanto a origem dos enxer-

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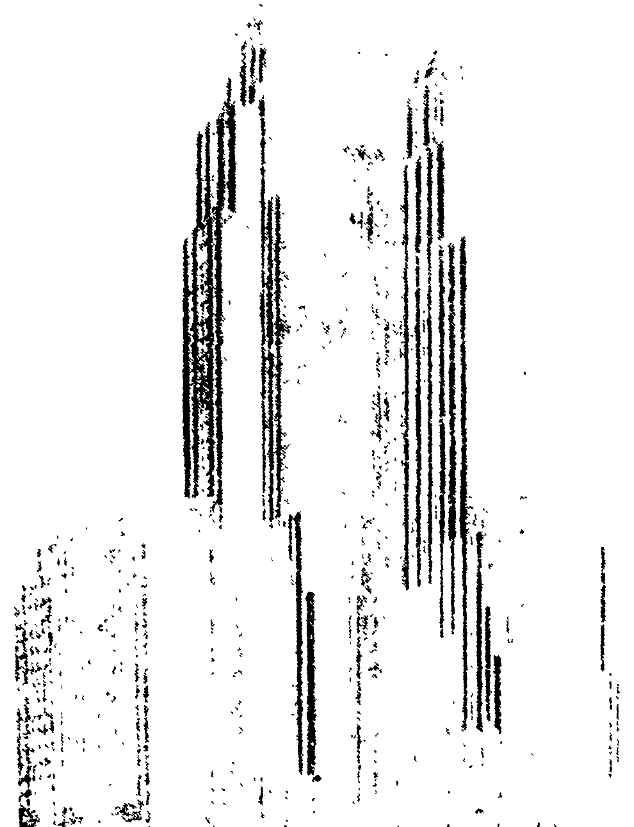

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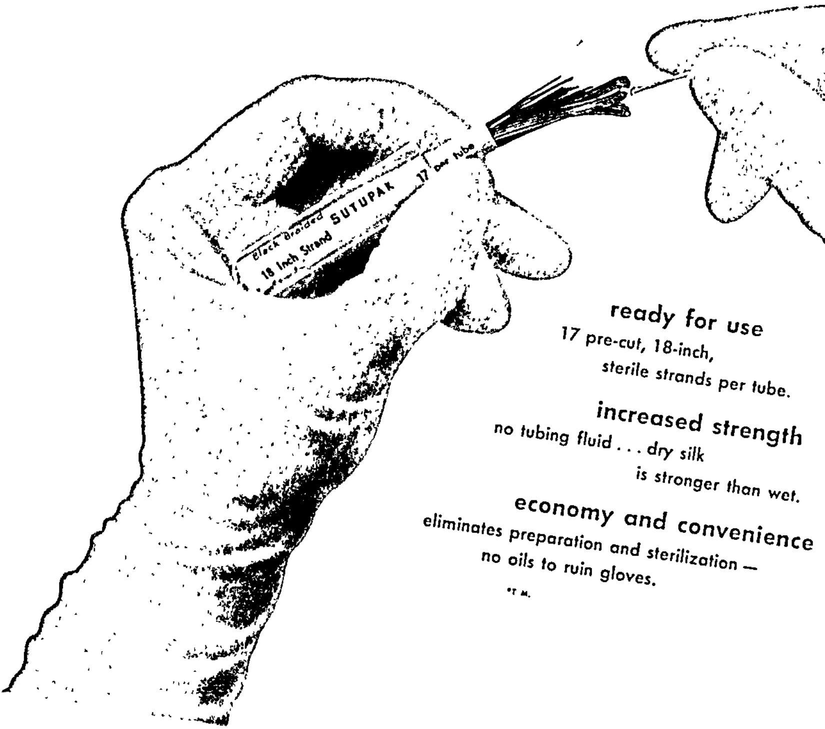

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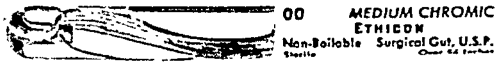

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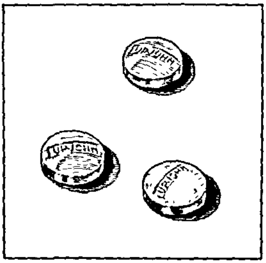

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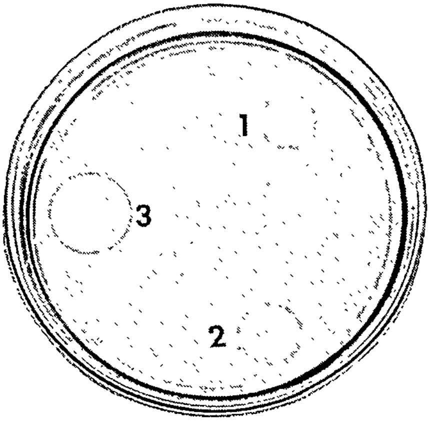

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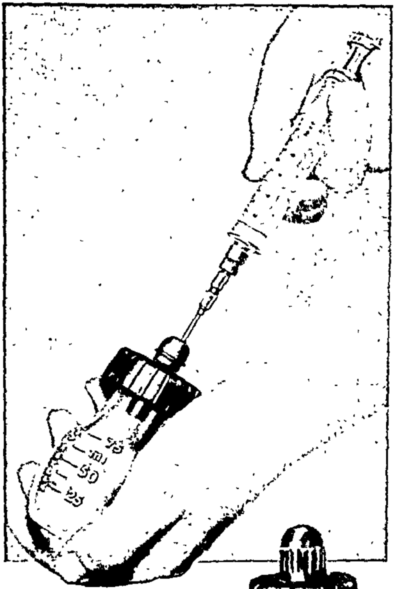

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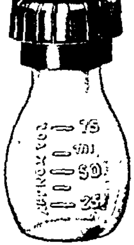

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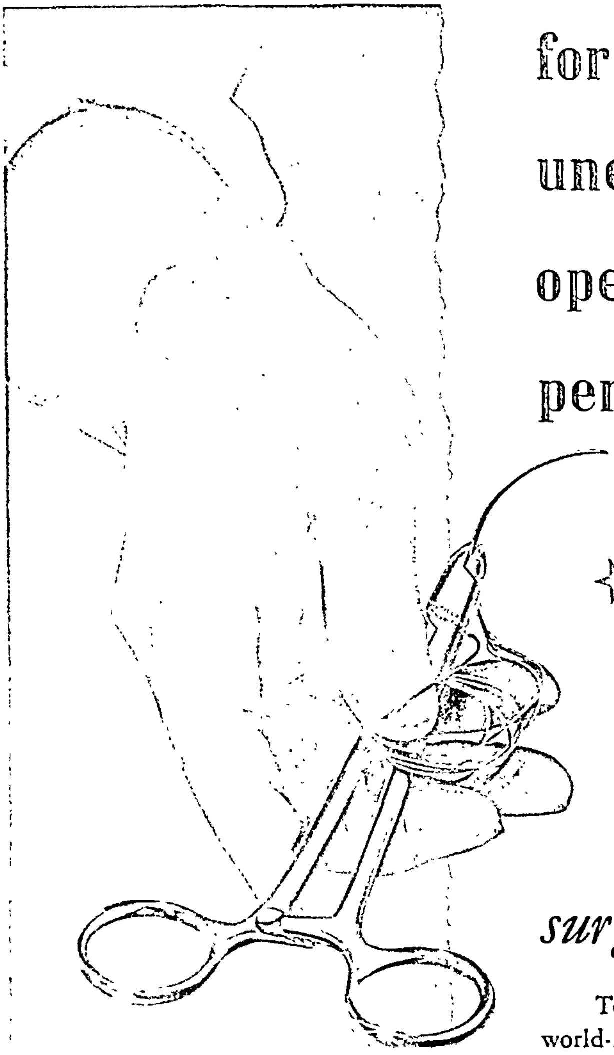

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The Surgeons' Hall of Fame

Its Significance in the World of Today

ONE of the most important forces for inspiring young men toward progress in medicine and surgery and toward high moral and ethical standards is the cultivation of adequate knowledge of and respect for the notables of the past. Unfortunately the history of medicine is but poorly taught, often not taught at all. Stephen Paget in his "Confessio Medico" begins an essay, "It seems a pity that the good example of Ambroise Paré is almost forgotten." The name of Guy de Chauliac is known to but few surgeons. Indeed, they know but little of surgery as described in the Edwin Smith papyrus or even the Hippocratic texts. Modern education utilizes the exhibit and display, the museum, the motion picture and other technics of teaching which make learning easy.

The inspired concept recently presented to the Board of the International College of Surgeons by Dr. Max Thorek for establishing a Surgeons' Hall of Fame has already been acclaimed among its fellows and through the press. Early realization of this achievement will depend, of course, on cooperative support and on the maintenance of interest on a high level.

I have had the honor, with Dr. Rudolph Nissen, of being appointed co-chairman of a committee to draw up a constitution and by-laws for the project, including a method of selecting nominees. Already a plan for

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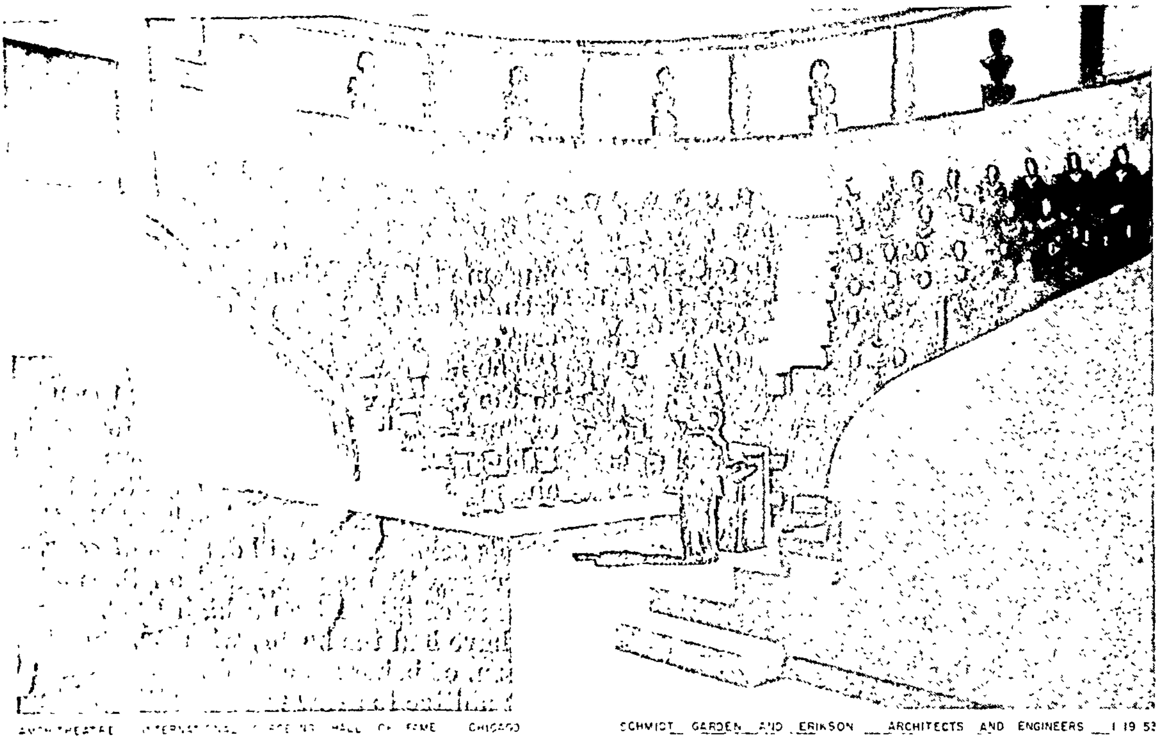
Architect's preliminary sketch of entrance to the Surgeons' Hall of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Architect's preliminary sketch of the amphitheatre in the Surgeons' Hall of Fame.

the preparation of suitable sculptures, portraits and plaques, a technic for the storing of historical records and mementos, and a design for the hall have been prepared. Fortunately, again through the foresight of the Board of the International College of Surgeons, an appropriate building, perfectly situated and with adequate space, is already available in Chicago.

The concept of the Surgeons' Hall of Fame will be presented to coming assemblies of the organization, and interest is sure to become intensified. No surgeon works with the idea of fame as his driving motivation. Fame comes through recognition of his devotion to his great art, to the people whom he serves, and to the advancement of knowledge. James Russell Lowell wrote:

"Notoriety may be achieved in a narrow sphere, but fame demands for its evidence a more distant and prolonged reverberation."

When the end of a great career has come and there has been time to evaluate the total contribution that a surgeon has made to humanity, the values thus contributed may be in part lost unless the record and its significance are kept continuously before the students of the future.

MORRIS FISHBEIN, M.D.

Fellows of the International College of Surgeons Honored by Armed Forces Medical Policies Council

It is with great pleasure that we announce to Fellows of the International College of Surgeons their official recognition and ratings as specialists by the Armed Forces Medical Policies Council. A request to this effect recently submitted to Dr. Melvin A. Casberg, Chairman of the Council, was promptly and graciously granted, and both request and response are here presented. We take this means of acknowledging the honor done us and the appreciation therein implied of the high standing of the College and its Fellows. The letters are self-explanatory.

Dr. Melvin A. Casberg, Chairman
Armed Forces Medical Policies Council
Office of the Secretary of Defense
Washington 25, D. C.

Dear Dr. Casberg:

The officers, the Executive Council and the Qualification and Examination Councils of the United States Section of the International College of Surgeons respectfully submit the following facts for your consideration:

The International College of Surgeons is a nonprofit educational organization whose officers serve on an entirely voluntary basis, receiving no emolument. The College has been in existence for seventeen years.

The United States Section of this organization is composed exclusively of citizens of the United States, graduates of United States schools, who specialize in surgery and the surgical adjuvant fields. The membership of this Section consists of Fellows, Associate Members and Junior Members. Admission to any of these ranks, which in the formative period of the College was determined by merit is now contingent upon an impartial and thorough evaluation of the applicant's ethics and experience and upon rigid entrance examinations both written and oral. These examinations last two days and are given by members of the Faculties of Northwestern University, the University of Illinois and Loyola University. All Examiners are members of the American Board of Surgery and are officially connected with universities. The practical (oral) examinations are given at Cook County Hospital, each candidate being examined by two Board members.

The total membership (all grades) of the United States Section is 4,500. Admission to Fellowship requires and implies a high standard both of ability and of character. Of the members admitted last year, only 300 were admitted as Fellows. Of these 300, 81 per cent were Fellows of the American College of Surgeons, members of the American Board of Surgery, or both. This is in line with the established practice of the International College of Surgeons, which emphasizes cooperation with all recognized surgical groups to disseminate knowledge and encourage progress in Surgery.

Postgraduate courses in surgery and the allied specialties are sponsored throughout the world. In this country, of course, these are provided by the United States Section, nearly 700 of whose members hold university teaching positions. In other parts of the world there

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ARMED FORCES MEDICAL POLICY COUNCIL
WASHINGTON 25, D. C.

JAN 23 1953

Dear Doctor Meyer:

Your communication of 1 December 1952, requesting that Fellows of the United States Section of the International College of Surgeons be recognized as specialists in the Armed Forces, was presented to the Armed Forces Medical Policy Council at its meeting on 16 January 1953.

The Medical Policy Council requested that I assure you that Fellows of the United States Section of the International College of Surgeons will be given full recognition for the efforts they have expended in attaining their position, and every effort will be made to assign them as specialists in accordance with their professional training.

Wishing you and the Fellows of the United States Section of the International College of Surgeons every success in the attainment of your professional objectives, I remain

Sincerely yours,

Melvin A. Casberg, M.D.

Melvin A. Casberg, M. D.
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Vol. XIX FEBRUARY, 1953 No. 2

Original Articles

Surgical Management of Diverticulitis of the Sigmoid

CHARLES G. LENHART, M.D., F.A.C.S., F.I.C.S.
AND
JAMES P. FLEMING, M.D., F.I.C.S.
ROCHESTER, NEW YORK

UNIVERSALLY there still exists considerable confusion regarding the proper management of complications of diverticulitis of the colon, but it is now somewhat less because of the discovery and use of the antibiotics and streptomycin. Knowledge of the anatomopathologic picture is paramount in determining the proper surgical approach to each phase of the disease. It has therefore been our privilege to review briefly this aspect of diverticulitis, as well as its complications and their surgical management.

Since the history, etiologic factors, incidence and symptoms have been adequately presented in the literature,[1] no attempt here will be made to delve into them.

Anatomopathologic Picture.—The anatomopathologic chain of events associated with diverticulitis is one of inflammation. It begins in one or more diverticula with mildness or with violence. It may subside, or it may progress through a stormy series of events to complications. The complications are well known. They are (1) simple abscess with slow or abrupt perforation; (2) peritonitis; (3) the formation of fistulas to contiguous organs or to the abdominal wall; (4) obstructions, and (5) coincidental carcinoma.

The simplest of the inflammatory processes is acute diverticuliti

or more

Submitted for publication Nov 11, 1952.

diverticula. It is usually the result of retention of the inspissated fecal content. The wall of the diverticulum becomes edematous owing to pressure circulatory disturbance; the neck constricts; ulceration occurs, and the inflammatory process now extends itself to the contiguous bowel wall, to the mesentery and often to an adjacent viscus. If the process is severe, abscesses may form, and since most diverticula[2] occur at the entrance of the vessels on the mesenteric side of the bowel and are prone to herniate in the mesenteric fat, the abscess may evacuate from the diverticulum into the mesentery. When it does so, the mesentery becomes thickened; the bowel becomes angulated, and the marginal artery, veins and lymphatics, as well as other mesenteric vessels to the bowel, become further blocked, with increased edema and thickening of both mesentery and sigmoid. Obstruction is the end result. If the abscessed diverticulum does not rupture into the mesentery, it may evacuate itself into the lumen of the bowel, and then the process subsides. If it has evacuated into the free peritoneal cavity, the result is often violent and disastrous. Peritonitis is diffuse, and the mortality and morbidity rates are high. Should the abscessed diverticulum extend itself to a contiguous viscus, various types of fistula may occur, namely, vesicosigmoid, ileosigmoid or sigmoido-abdominal.

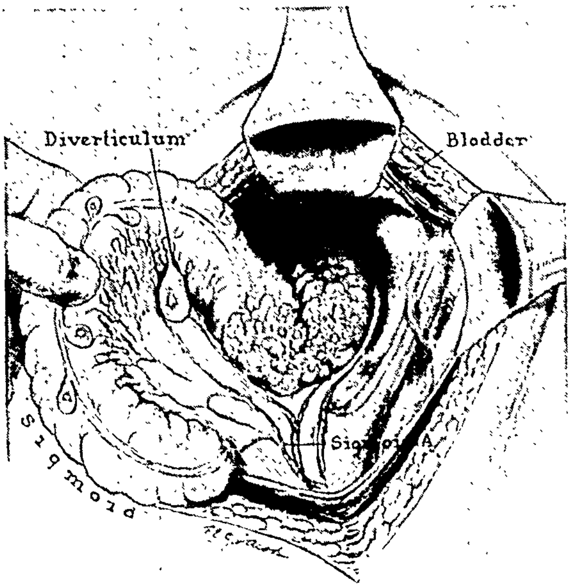

Fig. 1.—Constricted phlegmon as seen in cases of acute diverticulitis of sigmoid, with angulation and fixation of sigmoid, causing obstruction.

Complications. — The complicating inflammatory chain of events occurring in about 20 per cent of patients with acute diverticulitis must be clearly understood by the surgeon. If the acute phase of the disease is not diagnosed or if it resists medical therapy, then we consider the disease complicating and irreversible unless surgical intervention is prompt. It is in the beginning of this phase that the chain of complications may occur. Therefore, when the diagnosis of acute irreversible diverticulitis is made, intervention should be immediate, as for acute appendicitis.

We have been most keenly interested in early surgical intervention in all cases of acute irreversible diverticulitis as a means of observing the stage in the inflammatory cycle that the inflammation has reached; to visualize the impending complication, if present, or about to occur; to reverse the so called irreversible chain, surgically; and so often so difficult to differentiate coincidental carcinoma.[3]

When simple abscess, with or without perforation, is observed, it is universally agreed that surgical drainage of the abscess is the procedure of choice. If a small perforation is present an attempt to close it should be made, utilizing the appendices epiploicae, but if the perforation is large, closure is hazardous, as the sutures do not hold. Drainage by cofferdam, to be discussed subsequently, is advised. Exteriorization is usually not possible. If the abscess has evacuated itself into the mesentery and the events heretofore described as leading to obstruction are observed, with the complete picture of peridiverticulitis, mobilization of the phlegmon must be done even in the presence of frank pus. Arguments against breaking down the so-called protective barrier are preantibiotic. Colostomy, first described by Mayo[4] in 1907

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for obstruction and perforating diverticulitis, is often blindly and unnecessarily done, only to allow the inflammatory process *in situ* to continue to further complication.

After aspiration of frank exudate and mobilization of the constricted phlegmonous segment (Fig. 1), a cofferdam utilizing four Penrose wick drains, 12 inches (30 cm.) in length, with an incorporated Babcock[5] or Chaffin[6] tube, is utilized by us, as shown in Figure 2. The four wick drains are arranged side by side and are covered longitudinally with petrolatum gauze strips, with an incorporated Chaffin or Babcock intraperitoneal drain in place. This dam (Fig. 3) is then placed along the mesial side of the mobilized phlegmon (Fig. 4). Sulfanilamide powder (5 Gm.) is sprinkled about the drain, and 400,000 units of penicillin and 0.5 Gm. of streptomycin are placed along either gutter. Care must be taken to allow the bowel to rest upon the four Penrose elements of the drain and to make sure that portions of the drain extend to the depths of the pelvis. The drain is exteriorized usually through a stab incision parallel to the original operative incision. Gomco or Babcock forced intraperitoneal suction (Figs. 5 and 6) is used for the first four days. A small rectal tube is passed per rectum to and into the mobilized phlegmon (Fig. 4). A Harris tube preoperatively *in situ* is passed well into the small bowel. The drains are removed one by one, beginning on the fifth postoperative day, and lastly the petrolatum gauze strips are removed.

The employment of this technic, utilized by us in selected cases in which abscess, with or without perforation, has occurred, and in the presence of apparently complete obstructions, has been successful. Its advantages are: 1. The stage along the inflammatory chain can be observed and the complication evaluated. 2. The angulation above the rectosigmoid causing obstruction, if present, is overcome by the breaking up of adhesions. 3. The lymphatic, venous and arterial stasis, surely an associated obstructive factor, is partially overcome. 4. Further peridiverticular adhesions about the bowel are destroyed and do not recur, allowing the constricted bowel to expand circumferentially. 5. The cofferdam walls off the bowel from contiguous extension of the inflammatory process to the other organs. 6. In perforations, drainage is continuous and forced and closure is spontaneous. 7. By mobilization, an opportunity is afforded to identify the presenting lesion as carcinom

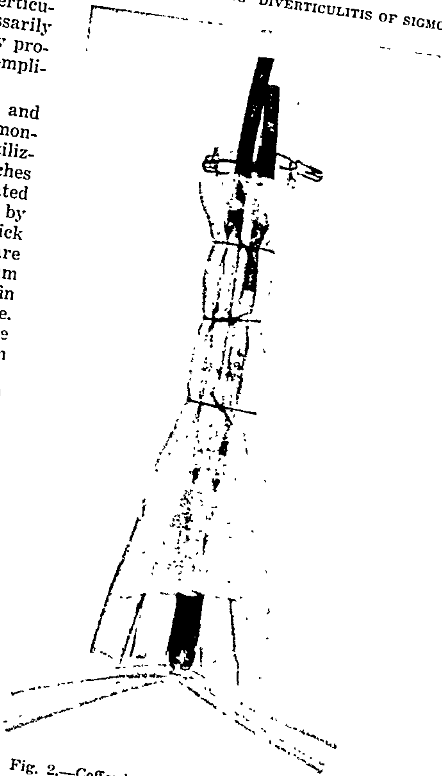

Fig. 2.—Cofferdam, completely assembled.

phlegmon." 8. Colostomy usually is avoided. 9. Following a strict diverticulitis regimen (this to include diet, oral antibiotics, and warm oil retention enemas) makes conditions favorable for resection, if needed, in three to four weeks.

When obstruction is complete and of long standing, and when the condition of the patient is grave and does not permit lengthy surgical procedures, this method is not advocated. Then, of course, transversostomy of the Wangensteen or the Devine type is advised.

A procedure used often on the continent of Europe and advocated by Hartmann[7] is anterior resection of the sigmoid, with permant colostomy and extraperitonization of the closed rectal stump. It presents a multiplicity of points in its favor. The diseased segment is extirpated at once, and the obstruction overcome by single-barrel colostomy. Later, the colostomy can be transplanted to the rectosigmoidal stump by invagination anastomosis, open primary anastomosis or metallic or plastic button technic when there is retraction of the distal segment. This procedure has been successfully utilized in 3 of our cases in which coincidental carcinoma was observed. Each of these cases was further complicated, 1 by vesicosigmoidal fistula, 1 by perforation and 1 by complete obstruction.

Fistula.—This is a most serious complication, whether it is to the urinary bladder, to a loop of small bowel or to the abdominal wall. The complication is usually the result of repeated episodes of acute diverticulitis. Sutton,[8] in a report on vesicosigmoidal fistulas, stated that the most common cause was abscess in the region of the uterine adnexae. The next most common cause was diverticulitis. Usually the accepted procedure is defunctionalization. We advise a complete defunctionalization procedure, usually of the Wangensteen or the Devine type, followed by resection of the phlegmon and closure of the vesical opening. Here again the Hartmann procedure can be utilized, but only if the inflammatory reaction about the fistula to the bladder is not extensive. Otherwise, primary closure of the vesical opening will not be successful. Resection of the vesical dome and suprapubic exteriorization about a sump drain is advised, with use of McCrea's technic[9] as described and as employed by him after suprapubic prostatectomy. Colostomy alone, for any type of fistula, has little to offer with respect to cure and permanent relief of symptoms.[8] It must be followed by some type of resection before relief from symptoms can be obtained.

Coincidental Carcinoma. — Rowe[3] recently stressed the moral responsibility of the surgeon to differentiate coexisting carcinoma and diverticulitis. His review of the American literature[3] yielded only 62 authentic cases. We wish to report 3 of our cases of coexisting carcinoma and diverticulitis, each of which was managed by the Hartmann technic. Again we offer a plea for a definitive exploration, mobilization of the segment and immediate resection when a doubt exists, provided, of course, that the surgical conditions in the case will permit resection.

REPORT OF CASES

The reports on a selected number of our cases, presenting complications, should be of interest.

CASE 1.—R. G., a 53-year-old man, was admitted to the hospital with abdominal pain of sudden onset, distention, and diarrhea of two weeks' duration. A barium enema revealed a partial intestinal obstruction above the rectosigmoid. Sigmoidoscopic examination demonstrated angulation and fixation of the rectosigmoid. Abdominal examination revealed a mass in the left lower quadrant. Operation was performed on March 4, 1948, and an abscess in the mesial gutter of the sigmoid, with an obstructing phlegmonous diverticulous segment above the rectosigmoid and an obstructing loop of ileum contiguous and fixed to the mass, was observed. The ileum was freed from the phlegmon. The abscess was apirated and the angulated sigmoid mobilized. A cofferdam incorporating a Babcock drain was placed mesial to the mass. Recovery was uneventful. The patient was discharged on the twelfth postoperative day. At the time of writing there has been no recurrence of symptoms.

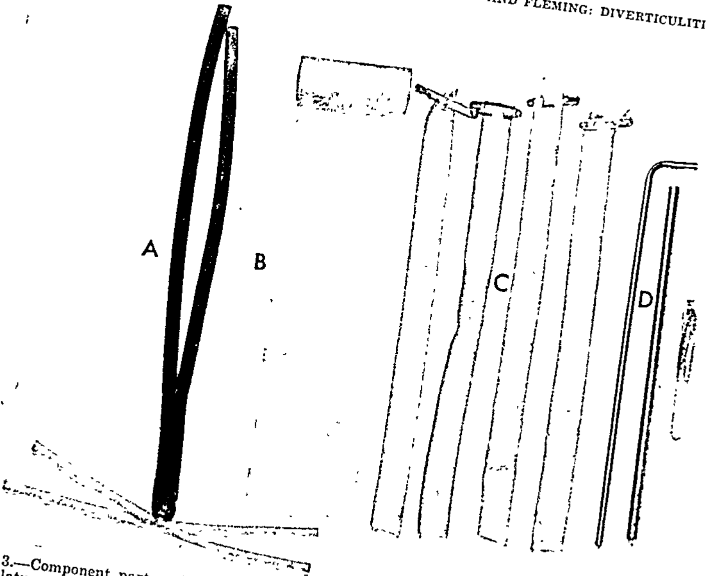

Fig. 3.—Component parts utilized in forming cofferdam. *A*, Chaffin tube; *B*, roll of 3-inch sterile petrolatum gauze; *C*, Penrose drains 12 inches in length; *D*, Babcock sump drain to be utilized, when desired, in place of Chaffin tube, and *E*, plain No. 0 catgut.

Comment.—This patient illustrates the necessity, in such a case, of interrupting the inflammatory chain of events that were leading to a severe complication—perforation, sigmoidovesical fistula or complete obstruction. By simple mobilization of the segment and freeing of the adherent small bowel from the lesion, and the use of an interposition dam with forced intraperitoneal sump suction, the disease was reversed, obstruction was overcome and further complications were avoided.

Case 2.—T. M., a 50-year-old white man, was admitted to the hospital with a twelve-hour history of pain in the lower part of the pelvis, acute distention, nausea and vomiting. Flat plates of the abdomen demonstrated distention of the small bowel with a "stepladder" effect. The patient was prepared for emergency operation. At operation on Jan. 21, 1948, acute diffuse peritonitis was observed, with associated ruptured diverticulitis of the sigmoid. Obstruction of the small bowel and necrosis of 14 feet of jejunum and ileum, secondary to sigmoidal diverticulitis, its perforation and peritonitis, was present. The 14 feet of jejunum and ileum was resected, a side-to-side anastomosis being employed. The sigmoidal inflammatory phlegmon was mobilized. No attempt was made to close the perforation. A cofferdam with intraperitoneal tube drainage was placed along the mesial gutter at the perforation. Recovery was uneventful, and the patient was discharged on the fourteenth postoperative day.

Comment.—Again the utilization of cofferdam drainage mesial to the ruptered phlegmon is demonstrated. Closure of the perforation was spontaneous, and further contiguous extension of the resected an-

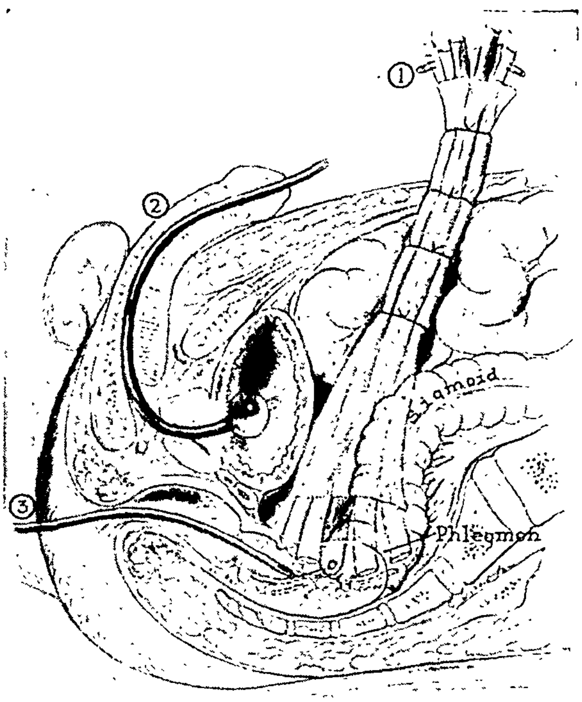

Fig. 4.—Cofferdam *in situ* along mesial side of mobilized phlegmon.

astomosed small bowel to the phlegmon was avoided.

Case 3.—H. G., a 51-year-old white man, was admitted to the hospital with one week's history of vague colicky pain in the abdomen, nausea, nocturia and pain low in the pelvis during urination. There was tenderness in the left lower quadrant, with rigidity of the rectus muscles. At operation on Jan. 7, 1941, an edematous obstructing sigmoid with peridiverticular inflammatory change was observed. The segment was mobilized and a purulent exudate aspirated from the gutter. A cofferdam drain was placed along the mesial gutter. Recovery was uneventful. The patient was discharged from the hospital on January 27. There has been no recurrence up to the time of this report.

Comment.—That "drainage is the first principle of surgery" in this type of case is universally accepted. The cofferdam technic in this case perhaps warded off the probability of further extension to an adjacent viscus or some other complication.

Case 4.—L. R., a 42-year-old man, a deaf mute, was admitted to the hospital with severe pain in the right lower abdominal quadrant, right rectus rigidity and positive rebound phenomena. At operation on Feb. 6, 1951, an abscessed diverticulum of the sigmoid containing a large fecalith (Fig. 7) was excised and closed. The sigmoid, long and redundant, was pulled over and fixed to the right lower quadrant. An appendix demonstrating periappendicitis (Fig. 7) was removed. It was fixed to the phlegmon (Fig. 8) in the displaced sigmoid. This contiguous phlegmon was mobilized and a cofferdam placed *in situ.* The pathologic diagnosis was periappendicitis. Recovery was uneventful.

Four months later the patient was readmitted because of severe episodes of pain and increasing constipation. A preoperative diagnosis of partial intestinal obstruction was made. A partially obstructing chronically inflamed segment of sigmoid (Fig. 8) was observed at operation on June 15. It was mobilized and resected, with primary anastomosis. No peridiverticular adhesion was noted at this time. Recovery was uneventful.

Comment.—This case demonstrates the necessity for resection, at a later date, of the chronically recurring diverticulous segment. Again the importance of surgical drainage is stressed and the use of the cofferdam is demonstrated. A surgical anomaly of the sigmoid was demonstrated.

Case 5.—F. F., a 56-year-old white man, was admitted to the hospital with severe abdominal pain and distention. Emergency surgical intervention on June 16, 1948, revealed acute diverticulitis and abscess of the sigmoid, with obstruction of the large bowel and partial obstruction of the small bowel due to a contiguous inflammatory extension to the ileum. The abscess was drained, the segment was mobilized and a cofferdam was placed mesial to the sigmoidal phlegmon. The patient overcame this obstruction after the operation. His recovery was uneventful, and he was discharged on July 1. Three years later he was readmitted for repair of a ventral hernia. Exploration of the sigmoid on March 2, 1951, revealed no evidence of diverticulitis or adhesions.

Comment.—In this case, early recognition of the disease and surgical intervention, the process was reversed. It is of interest to note that there was no gross evidence of the disease or adhesions three years later.

CASE 6.—A. S., a 42-year-old white woman, was admitted to the hospital because of abdominal distention which came on gradually over a six-week period, nausea and vomiting. A barium enema revealed an obstructing lesion above the rectosigmoid. Sigmoidoscopic study demonstrated an angulated, constricted and fixed segment above the rectosigmoid. A preoperative diagnosis of intestinal obstruction secondary to diverticulitis was made. Exploration on Aug. 25, 1947, revealed obstruction of both small and large bowel. A loop of ileum, completely obstructed, was adherent to an obstructed phlegmonous mass just above the rectosigmoid. A loop of small bowel was freed from the inflamed mass, and the phlegmon was mobilized. A small-caliber rectal tube was passed into the constricted sigmoid. A cofferdam with forced intraperitoneal Babcock sump drainage was placed mesial to the phlegmon and the dam exteriorized. The obstruction was overcome immediately, and postoperative recovery was completely uneventful. The patient was discharged on the fourteenth postoperative day.

Comment.—This patient had severe cardiac disease, and preoperatively the prognosis was grave because of marked cardiac decompensation. Any lengthy surgical procedure would have been hazardous. By the use of a mobilization and cofferdam technic, the obstruction was overcome and further complication avoided. The patient had no recurrence of the symptoms of diverticulitis to the date of her demise one year ago from cardiac failure.

CASE 7.—E. G., a 51-year-old white woman, was admitted to the hospital with a four-day history of pain in the left side, nausea and vomiting. Abdominal examination revealed a tender mass in the left lower quadrant. Exploration on April 10, 1944, revealed an unusually long inflamed contricted segment (11 inches, or 29.7 cm.), involving the lower part of the descending colon and the proximal portion of the sigmoid. The entire colon was distended proximal to the inflammatory mass. One segmental area in the phlegmon, and questionable coincidental carcinoma, were observed, and biopsy specimens were taken. The mass was quickly mobilized and exteriorized because of the patient's poor condition. It was covered with sulfanilamide powder and protected by petrolatum gauze. A rectal tube was passed high into the rectum. Within twelve hours the obstruction was completely overcome. The biopsy gave negative results for carcinoma. In four days the edema in the exteriorized phlegmon had subsided. On the sixth postoperative day the mass was replaced into the abdomen. There had been no recurrence five and one-half years later, at which time the patient's death was caused by acute atrophy of the liver. Autopsy revealed no evidence of inflammation at the site of the previous pathologic condition and no adhesions.

Comment.—This case illustrates several aspects of the problem of obstruction secondary to diverticulitis and the presence of questionable coexisting carcinoma. Because of the grave condition of the patient and because of a possible area of

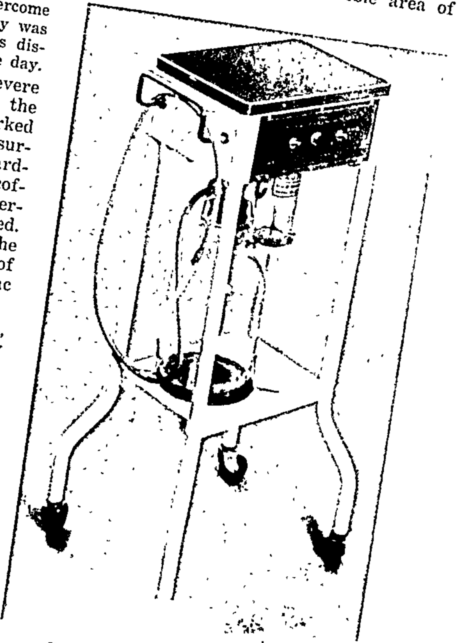

Fig. 5.

carcinoma, the diseased segment was rapidly exteriorized. If the patient had not overcome the obstruction as a result of exteriorization mobilization, the bowel could have been easily opened. If cancer had been present, the mass could have been resected and, later, the colostomy closed. As it was, in this "poor risk" patient the obstruction was overcome and the inflammatory chain toward further complication interrupted. Colostomy was avoided.

CASE 8.—W. D., a 66-year-old white man, was admitted to the hospital with a complaint of gradual abdominal distention, severe pain in the left lower abdominal quadrant with extension to the penis, urinary frequency and nocturia. Barium enemas revealed diverticulitis of the sigmoid and a defect within reach of the sigmoidoscope. Sigmoidoscopic investigation demonstrated an angulated, constricted fixed segment low in the sigmoid. On the day prior to sigmoidoscopic study the patient complained of a "bubbling of air" on urination. The preoperative diagnosis was diverticulitis of the sigmoid with a sigmoidoves
fistula. At operation on Oct. 15, 1947, a m
unquestionably carcinoma with associated
verticulitis and sigmoidovesical fistula,
noted. Extreme inflammatory reaction of
bladder was noted. A defunctionalization
cedure of the Devine type was done. Two
one-half months later a sigmoidectomy of
Hartmann type was performed. The ves
sigmoidal opening to the bladder was rese
and closed primarily. Plans to transplant
colostomy to the rectosigmoid were abando
at a later date because of metastatic invo
ment of the bladder and ileum by carcino
The patient's death four years later was
to extensive metastatic carcinoma.

Comment. — This case illustrates
method of management of diverticul
complicated by carcinoma and vesicos
moidal fistula.

CASE 9.—M. H., a 67-year-old white m
was admitted to the hospital complaining
severe abdominal pain, abdominal distent
and difficulty in bowel movement for the p
three weeks. A flat plate of the abdon

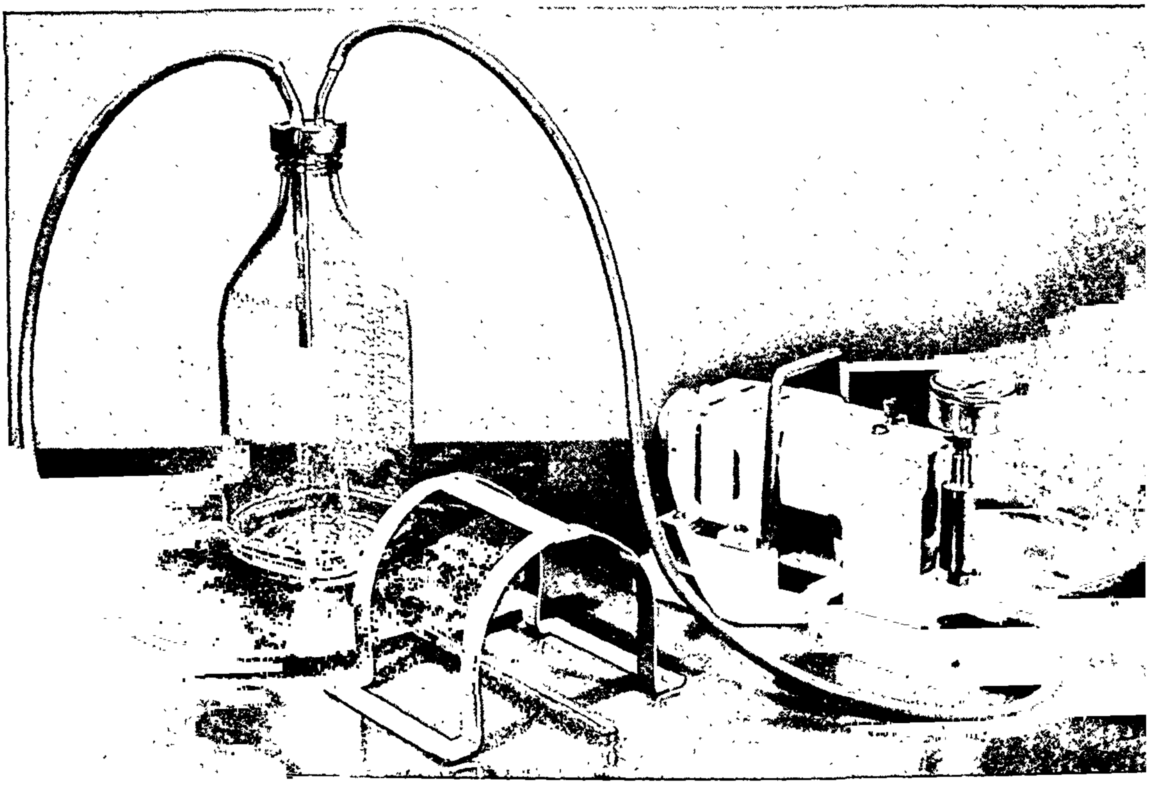

Fig. 6.—Babcock suction apparatus.

revealed obstruction of the large bowel. Sigmoidoscopic study demonstrated no intrinsic mass but an angulated, edematous constricted segment above the rectosigmoid. An exploratory procedure on Nov. 27, 1947, revealed a constricted fixed segment low in the sigmoid. Because the patient's condition would not permit it and because a doubt existed as to the presence of coincidental carcinoma, only a transversostomy was done. Two weeks later a second operation was performed. The mass was mobilized. Diverticulitis, with obstruction of the lower part of the sigmoid, was observed. Because of segmental edema, resection was not done.

Nine months later the patient was readmitted for resection. During the interval the lumen of the bowel, previously constricted, was observed to be patent on sigmoidoscopic examination. There was a large ventral hernia about the colostomy. At operation on Oct. 12, 1948, because of the presence of an area of suspicious induration in a diverticulum, anterior resection of the Hartmann type was done. The hernia was repaired. The pathologic specimen revealed a depth diverticulum with involved adenocarcinoma in its base. The patient is well at the time of this report. He refuses to allow us to transplant the colostomy to the rectal segment.

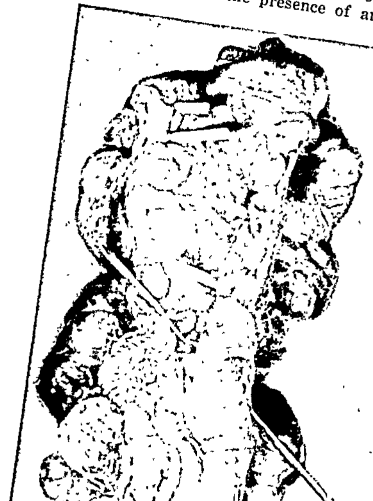

Fig. 8.—Inflammatory segment of sigmoid, showing internal openings of diverticula.

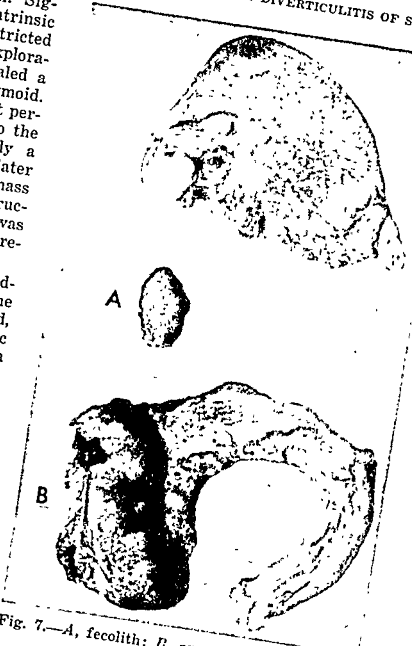

Fig. 7.—*A*, fecolith; *B*, appendix, demonstrating periappendicitis.

Comment. — The ever-existing possibility of coexisting carcinoma and diverticulitis must be realized. Fortunately, during the delay of nine months, no metastatic phenomena occurred. A plea for early resection is again made in such cases.

CASE 10.—E. M., a 65-year-old white man, was seen because of an anorectal fistula. He also complained of rectal bleeding, small stools and episodes of pain in the left lower abdominal quadrant dating back to 1942. Numerous barium enemas had revealed diverticulitis. A barium enema at this time revealed diverticulitis of the sigmoid and a constricted segment low in the sigmoid. Sigmoidoscopic study revealed no intrinsic mass but a fixed, edematous, angulated rectosigmoid. Operation was advised. The patient refused. Owing to weight loss and increasing rectal hemorrhages, however, he agreed to undergo operation six months later. An exploratory procedure on Aug. 19, 1948, revealed a perforating adenocarcinoma of the midsigmoid with extensive diverticulitis and metastasis to the liver. Because of the perforating nature of the lesion, a Hartmann procedure was done. Recovery was uneventful, but the patient died two years later of extensive carcinomatosis.

Comment.—This case is worthy of comment because it demonstrates the necessity of following cases of recurring diverticulitis by repeat roentgenographic studies, evaluation of symptoms, and sigmoidoscopic investigation. It likewise demonstrates a method of management of such a perforating lesion.

SUMMARY

1. The evolution of the anatomic pathologic changes in sigmoidal diverticulitis from solitary abscess to obstruction, perforation and fistula are discussed.

2. The interruption of the inflammatory chain of events toward complication by immediate surgical intervention is advised, with visualization, mobilization and drainage of the phlegmon, even in the presence of perforation or obstruction.

3. The use of a cofferdam technic for intraperitoneal drainage is described.

4. The moral responsibility for differentiation of the condition from coincidental carcinoma is stressed.

5. The colostomy, often performed needlessly, can be avoided, as inflammatory obstructions are frequently relative and not actual; reversible, rather than irreversible—usually so by this method.

6. Further methods useful in the management of complications are described, and an interesting series of cases is presented.

ZUSAMMENFASSUNG

1. Der Ablauf der anatomisch-pathologischen Veraenderungen bei der Divertikulitis des Sigma vom einzelnen Abszess bis zum Verschluss, Durchbruch und zur Fistelentstehung wird eroertert.

2. Es wird empfohlen, die Kette der zu Komplikationen fuehrenden entzuendlichen Vorgaenge durch unverzueglichen chirurgischen Eingriff mit Freilegung, Mobilisierung und Drainierung zu unterbrechen, auch wenn eine Perforation oder ein Verschluss des Darmes vorliegt.

3. Zur intraperitonealen Drainierung wird eine Technik mit Verwendung eines duennen Kautschuktuches beschrieben.

4. Die grosse moralische Verantwortung, die die Unterscheidung der Erkrankung von einem gleichzeitig bestehenden Karzinom in sich traegt, wird hervorgehoben.

5. Die Kolostomie wird oft unnoetiger Weise ausgefuehrt und sollte vermieden werden, da entzuendliche Darmverschluesse haeufig relativ und nicht endgueltig sind und sich unter Umstaenden zurueckbilden koennen. Gewoehnlich gelingt es mit der hier beschiebenen Methode, die Kolostomie zu vermeiden.

6. Es werden noch andere nuetzliche Methoden zur Behandlung von Komplikationen eroertert, und eine Reihe interessanter Faelle wird beschrieben.

RIASSUNTO

1. Viene trattata l'evoluzione anatomopatologica della diverticulite del sigma, dall'ascesso solitario alle occlusioni, alle perforzioni e alla fistolizzazione.

2. Si consiglia di interrompere questa serie di complicanze mediante un intervento chirurgico precoce, con esposizione, mobilizzazione e drenaggio del flemmone, anche in presenza di perforazione od occlusione.

3. Viene descritta una tecnica di drenaggio intraperitoneale a tenuta stagna.

4. Viene sottolineata la responsabilità della diagnosi differenziale di questa affezione col carcinoma.

5. Si deve evitare la colostomia, spesso eseguita senza bisogno, perchè le occlusioni infiammatorie sono spesso incomplete e reversibili.

6. Vengono descritti altri metodi utili nella cura delle complicazioni; viene infine presentata una interessante serie di casi.

RESUMEN

1. Se discute la evolución de cambios anatomopatológicos en la diverticulítis del sigmoide, desde el abcéso solitario hasta la obstrucción, perforación y fístula.

2. Se aconseja la interrupción de la cadena de eventos inflamatorios hacia la complicación, por la intervención quirúrgica inmediata, con visualización, mobilización y drenaje del flegmón, aun en presencia de perforación u obstrucción.

3. Se describe el uso de una técnica de "represa" para drenaje intraperitoneal.

4. Se hace notar la responsabilidad moral para la diferenciación de este padecimiento de un carcinoma asociado.

5. Puede ser evitada la colostomía a menudo realizada inecesariamente, ya que las obstrucciones inflamatorias son frecuentemente relativas y no absolutas, siendo por este método usualmente reversibles y no irreversibles.

6. Se describen además métodos útiles en el tratamiento de las complicaciones y se presenta una serie de casos interesantes.

SUMÁRIO

1. A evolução para as obstruções, perfurações e fistulas, nas perturbações anatomo-patologicas do abcesso solitario nas diverticulite sigmoidiadas, são discutidas nêste trabalho.

2. E aconselhada a interrupção do processo inflamatório proximo á complicação, pela imediata intervenção cirúrgica, com visualização, mobilização e drenagem do fleumão, mesmo nos casos de perfuração ou obstrução.

3. O emprego da técnica de "estancamento" na drenagem intra-peritoneal é descrito.

4. Salientam tambem os autôres a responsabilidade moral no diagnostico diferencial nos casos em que se apresente, por coincidencia, um carcinôma.

5. A colostomia, muitas vezes inutilmente executada, pode sêr evitada em tais casos.

6. Vários processos usados tratamento das complicações, são descritos, e uma interessante serie de casos é apresentada pelos autôres neste trabalho.

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Retroperitoneal Echinococcus Cyst Producing "Goldblatt Kidney"

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IT is not the purpose of this paper to discuss on a broad scale the diagnostic and therapeutic problems of the so-called Goldblatt kidney. However, we wish to report the following case, as we have not found a similar one in the literature at our disposal. An echinococcus cyst was located in such a manner as to exercise pressure on the renal artery, thus producing hypertension with all its consequences. Moreover, there were some unusual features in the postoperative course.

Sabin presented an extensive review of current knowledge concerning renal disease and hypertension. From the literature up to 1948 he collected 106 cases in which nephrectomy was performed. The most common cause was pyelonephritis, often associated with marked atrophy of the kidney. Other pathologic lesions were hydronephrosis, tuberculosis, hypernephroma, pyelonephritis with calculi, aplasia and hypoplasia, arteriosclerosis, renal cysts, rupture of the kidney, infarction, abnormalities, aneurysm of the renal artery, and ectopic kidney with a smooth muscle plug in the renal artery.

The end results of nephrectomy are not uniform. Kittering and Brown (cited by Rolnick) stated that "of those patients who require nephrectomy for well established unilateral renal disease, only a small percentage can expect relief from any coexisting hypertension." This is why clinical interest is focused on the problem of selecting the right cases for operation, those in which a permanent cure may be expected.

According to Sensenbach, the requirements to be fulfilled are: 1. The diseased kidney should be functionless or its function greatly diminished. 2. The opposite kidney should function normally. 3. The hypertension should be of short duration. 4. Other factors being equal, the younger the patient the greater the chance of favorable results after nephrectomy.

REPORT OF CASE

J. V., a youth aged 19, was first seen at the urologic department in August 1950, when he was transferred from another hospital. His general anamnesis was essentially unimportant. He suffered from severe headache of three months' duration, general weakness and disturbance of vision. Physical examination revealed him to be well developed and well nourished. His height was about 170 cm. The temperature was 37.3 C. and the pulse rate 88. The oculist noted pathologic changes in the retinas, edema of the papillae, constriction and kinking of the arteries and star-shaped signs of degeneration in the maculae. There were retinal hemorrhages, especially in the right retina. At that time the blood pressure in millimeters of mercury covered the following range: 180 systolic and 130 diastolic; 190 systolic and 135 diastolic; 200 systolic and 135 diastolic; 185 systolic and 125 diastolic. The electrocardiogram showed a left cardiac strain.

Laboratory Data.—The urine albumin was 0.6 *pro mille.* The sediment sometimes contained a few hyaline and granular casts. Values for blood urea ranged through 28 mg., 24 mg., 33 mg., and 20 mg. per hundred cubic centimeters. The urea clearance test yielded values of 49, 44, 66 and 55 per cent. The sedimentation rate was 54/89; the hemoglobin content, 12 Gm. The white blood cells numbered 11,000 and 8,700 per cubic millimeter.

From the Urologic and Internal Medicine Services the Sharon Hospital, Petah-Tikvah.

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The urine concentration was up to 1018-1020. Bilirubin, 0.25; calcium, 9.6; phosphorus, 4.5; total protein, 6.5; albumin-globulin ratio, 3.9/2.6. Intravenous pyelographic study showed excretion on the left side only. The left kidney was enlarged as compared with the right. Pyeloscopic examination of the right renal pelvis revealed enlargement of the calyces to the size of a cherry. The pelvis was small. On cystoscopic study no dye was excreted from the right kidney.

Diagnosis of a Goldblatt right kidney was made, but operation had to be postponed because of phlegmasia alba which developed in the left leg, with fever. The patient was readmitted on December 27. His general condition was essentially the same. Daily blood pressure levels revealed great differences, ranging from 240 systolic and 150 diastolic to 160 systolic and 110 diastolic. There were fresh hemorrhages in the retinas and a nephritic stare; the arteries were contracted, and edema was observed at the point of entrance of the optic nerve.

Repeated urologic investigation — intravenous pyelograms were taken three times in four months — showed the same picture previously described—no excretion from the right kidney, which was smaller than the left one. A ureteral catheter was left for several hours in the right renal pelvis, but no urine passed. The urea content was 25 mg. per hundred cubic centimeters; the results of clearance tests, 70 and 80 per cent. Dilution and concentration ranged between 1004 and 1020. Values obtained by the Exton-Rose test were 83, 120, 131. The electrocardiogram was regular. The alkali reserve was 54 per cent.

Diagnosis and Indications for Operation.— This case was unusual in that the patient was under 20 years of age, suffering from hypertension of not more than one year's duration, with severe troubles of sight and a nonfunctioning, apparently hypoplastic kidney. The disease seemed to be progressive. A pheochromocytoma could be excluded, since there were no attacks of paroxysmal hypertension. In our opinion operation was indicated, though we had some doubts concerning the final outcome.

Operation (E.L.). — Operation was performed on Jan. 8, 1951, with the patient under general anesthesia, and lasted for three hours. The kidney was located high under the ribs, and the eleventh rib was resected. A large mass was encountered at the medial border of the kidney, which extended from the adrenal along the course of the ureter down to the pelvis. This tumor was as hard as cartilage. The medial border of the mass could not be clearly discerned. The abdominal portion of the aorta and the common iliac artery could be felt distinctly to be connected with the tumor. A line of cleavage could not be found.

The lumbar incision was enlarged to the lateral margin of the rectus abdominus muscle, after which an attempt was made to separate the kidney from the tumor in order to obtain more space for extirpation of the latter. This had to be done very carefully, step by step. It was impossible to isolate the renal vessels from the tumor. Apparently they were impacted in its wall.

Suddenly the tumor burst at the rear of the partially isolated kidney, and it was at once clear that an echinococcus cyst was present. The cyst could be easily delivered and was the size of an orange. There were also two daughter cysts, each the size of a cherry. With more space at our disposal, the ureter could then be freed and ligated. Advance was slowly made to the renal hilus. However, its isolation was still impossible. We proceeded along the anterior aspect of the kidney and the wall of the "tumor" and cut finally through the renal vessels. There was no spurting from the artery, but only some oozing. The artery could distinctly be seen in the wall and was clamped and ligated. There was no doubt that it was under strong pressure from the surrounding wall of the echinococcus cyst.

Because of the dangerous proximity of the large arteries, no attempt was made to extirpate the whole wall of adhesions around the cyst. A drain was inserted into the former cystic cavity and a second one at the deepest point of the wound.

The patient left the operating theater in fair condition. He was given an infusion of 1 liter of physiologic solution of sodium chloride and 1,500 cc. of blood. On the next morning another blood transfusion was done, and thereafter 1,000 cc. of plasma was added.

During the operation the blood pressure went dramatically down to 95 systolic and 80 diastolic. A checkup after two hours showed it fixed at about 100 systolic and 85 diastolic. On the next day it varied between 80 to 120 systolic and 30 to 75 diastolic. Thereafter it rose steadily to 175 systolic and 100 diastolic on the twelfth day and went slowly down. It may be that this rise was connected with the other complication, which occurred after the operation (Chart 1).

The urine output was 416 cc. during the first twenty-four hours; then severe oliguria occurred. On the second day only 45 cc. of reddish urine was passed, which contained much hemoglobin. On the third day 120 cc. was recovered; on the fourth day, 77 cc.; on the fifth day, 350 cc., and afterward the amount rose quickly to more than 5 liters on the twelfth day. These large quantities were excreted up to the twenty-ninth day, after which the daily output was within normal limits. The highest specific gravity on the twelfth day was only 1.001 and on the fourteenth day 1.004.

The blood urea level rose to 150 mg. per hundred cubic centimeters on the second day and increased to 332 mg. on the eighth day. There was a gradual fall to 69 mg. on the fifteenth day, to 51 mg. on the twentieth day, and to 43 mg. after the twenty-eighth day.

The alkali reserve was 49 per cent. On the second postoperative day, a drop to 45 per cent and 42 per cent occurred. However, a rise occurred on the eighth day to 51 per cent, after which it remained at about 50 per cent.

The sodium chloride content of the blood was 525 mg. on the third day. It dropped to 491 mg. on the seventh day but rose constantly during the second week and reached 595 mg. on the thirteenth day (Chart 2).

The general condition of the patient was really grave during the first twelve days. There was edema of both legs, and the scrotal skin also was swollen. The patient's consciousness was disturbed. His general condition caused much concern.

A diagnosis of "lower nephron nephrosis" due to the blood transfusion was made. The clinical picture was fully developed and the course typical. Two distinct phases could be observed, the oliguric and the diuretic. The critical time was between the sixth and the eighth day, when the urea level was at its highest; however, the urine output rose to enormous quantities. The urea content dropped only two days later.

Treatment of the Lower Nephron Nephrosis.—As the temperature was elevated during the first two weeks after the operation, the patient was given both penicillin and streptomycin.

During the oliguric phase the intake of fluids was limited to 1,500 cc. every twenty-four hours and an additional quantity equal to the output of urine on the respective day. Most of the fluid was given as 5 per cent dextrose and the smaller part as sodium chloride and sodium lactate, according to the level of

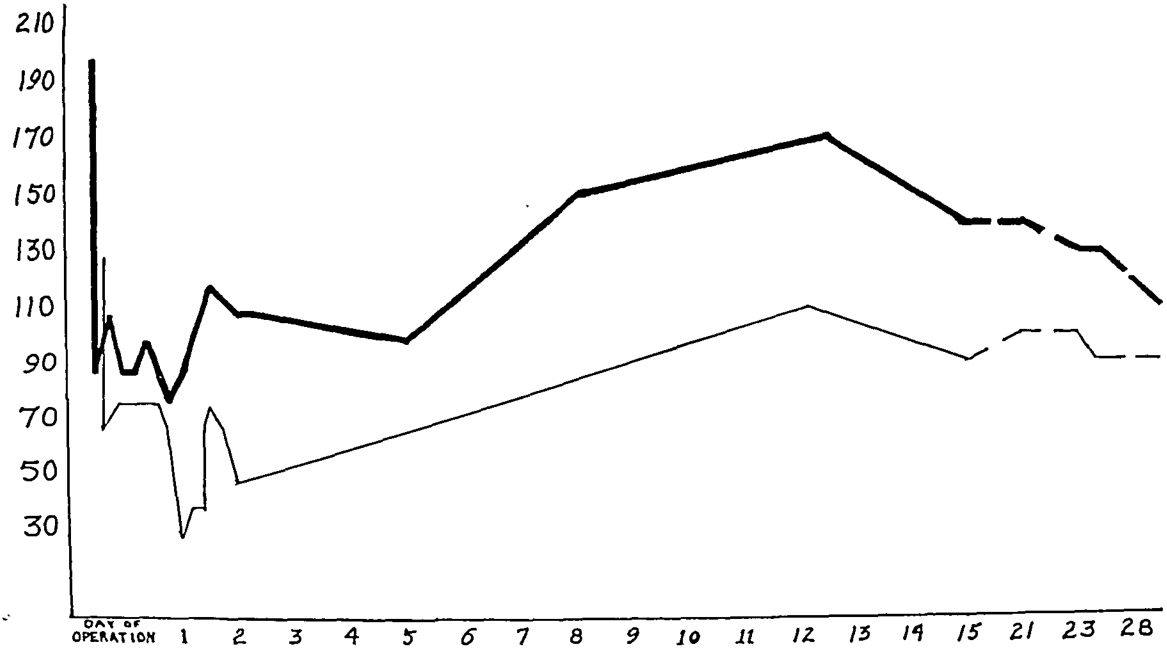

Chart 1.—Systolic (heavy black line) and diastolic (thin black line) blood pressure during the four weeks immediately following the operation.

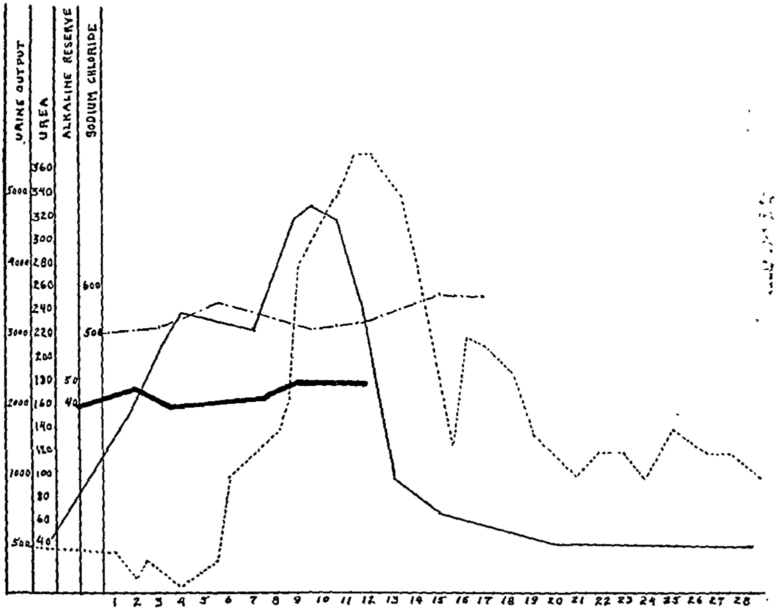

Chart 2.—Urine output, urea content, sodium chloride output and alkali reserve during four weeks after the operation. Note that the urea level is still rising, though diuresis has begun and the output of urine is remarkably high.

the alkali reserve. Whether by chance or not, diuresis began on the very day when the patient was given an infusion of 1 liter of sodium lactate. On that day the alkali reserve was at its lowest level—41 per cent.

During the second stage, sufficient quantities of water and electrolytes had to be provided. After the ninth day, when the patient began to eat and drink, there was no need for further infusions. His diet consisted essentially of carbohydrates and small quantities of fat, but was without salt and albumin. Later on the quantity of salts was in accordance with the quantities eliminated by the urine.

Pathologic Examination (Dr. Casper, Pathologist to the Beilinson Hospital, Petah-Tikva, Jan. 10, 1951).—The kidney was relatively small and harder than normal. There was a hematoma under the capsule, which was consequently elevated. The surface of the kidney was not smooth. Near the hilus some proliferation of tissue and scar formation were seen. The ureter and the blood vessels were within the scar formation. The preparation contained the adrenal gland also, but no changes were observed therein.

In addition, a cyst of the echinococcus type, the size of an orange, was delivered for examination (Fig. 1).

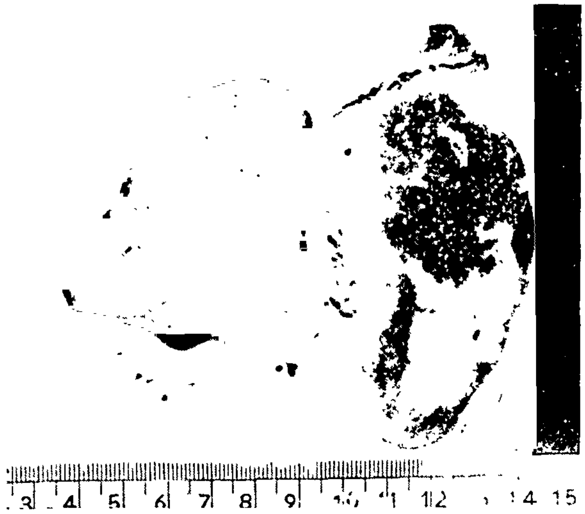

Fig. 1.—Echinococcus cyst and extirpated kidney, described in text.

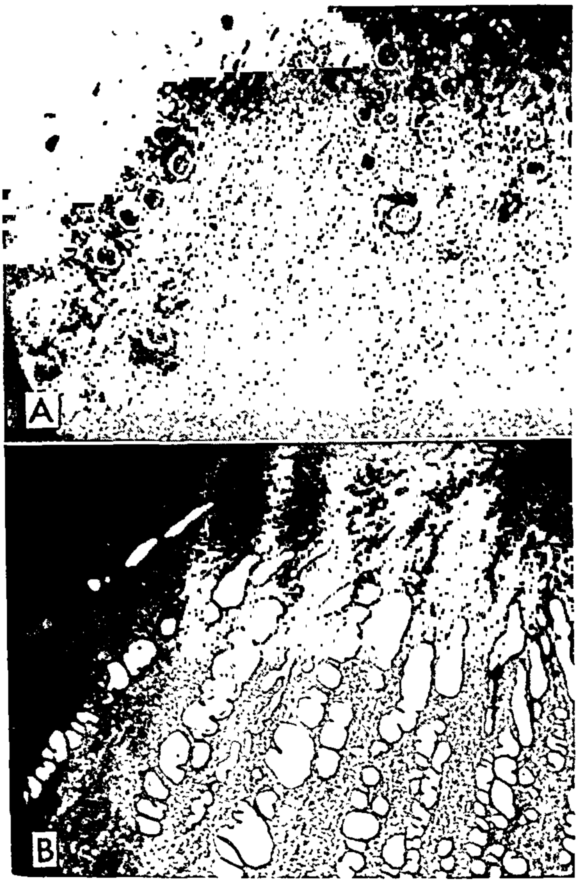

Fig. 2—*A*, destruction and hyalinization of some of the glomeruli. *B*, enlargement of tubules near surface of renal pelvis; others rather atrophic.

tubules of the pyramids were atrophic; they were closed, and their epithelium showed fatty degeneration (Fig. 3). The epithelial cells of the convoluted tubules were also partially filled with fat.

There were no changes in the blood vessels, either the small arteries or the capillaries. The histologic picture showed no special characteristic changes except those in the interstitial tissue.

The patient did well after recovery from lower nephron nephrosis and has been observed at regular intervals since the operation. At the time of writing he is working as an office clerk. His blood pressure has remained within normal limits during the year and in January 1952 was 120 systolic and 80 diastolic. During the whole year of 1952 the blood pressure and biochemical values remained normal. The sedimentation rate in one hour was 26 mm.; the value for urea, 22 mg. Urea clearance tests yielded a value of 140. His sight has improved steadily. There are no more hemorrhages in the retinas, and the papillae are normal. There is, however, some distention of the veins over the abdomen, and there is also a hydrocele, which is drained from time to time, as the patient does not desire further operative treatment.

COMMENT

Two diseases had substantially to be excluded: coarctation of the aorta and pheochromocytoma. The absence of vasomotor crises and the steadiness of the elevation in blood pressure, together with the fact that no characteristic pyelographic changes were observed, made the presence of a pheochromocytoma unlikely. There was some suspicion that a hypoplastic, nonfunctioning right kidney might be responsible for the high blood pressure. It can be assumed with certainty that the severe changes in the eyegrounds took place during the last year before the operation. At that time the patient applied for membership in the sick fund. His blood pressure was regular, as were his eyes. At about the same time he was found fit for military service. The marked changes in the retinas made intervention mandatory. To have waited any longer for operation might have led to irreparable changes in the eyes and blood vessels.

SUMMARY

The case is reported of a young man with disturbance of sight and high blood pressure. Severe changes in the eyegrounds, plus hypertension, called for a urologic investigation, which revealed a nonfunctioning right kidney. Operation was performed under the tentative diagnosis of "Goldblatt kidney". A retroperitoneal echinococcus cyst was discovered at operation, exercising pressure on the renal vessels. These vessels were situated within the wall of the cyst. Both kidney and cyst were extirpated by a rather difficult operative technic.

The postoperative course was dramatic, as lower nephron nephrosis developed, with hemoglobinuria, oliguria near to anuria, uremia and acidosis. The cause was apparently a blood transfusion given at operation.

By well-considered conservative treatment based on daily biochemical determinations, this very serious condition was overcome. Any further surgical intervention, such as peritoneal lavage, was avoided, as it would have endangered the exhausted patient.

The indications for this operation are discussed and are in accordance with the requirements set forth by Sensenbach. The diagnosis of "Goldblatt kidney" seems justified, though the cause was rather unusual.

RESUMÉ

C'est l'histoire d'un jeune homme présentant des troubles visuels et de l'hypertension.

Des troubles graves oculaires (fonds de l'oeil), de l'hypertension ont nécessité l'examen urologique qui a démontré que le rein droit ne sécrétait pas. Avec l'etiquette de "rein de Goldblatt" le patient fut opéré. A l'opération, on découvrit un kyste rétropéritonéal à échinococcus comprimant les vaisseaux. Ils se trouvaient à travers les parois du kyste. Le rein et le kyste furent enlever avec difficulté.

L'évolution post-opératoire fut dramatique; une néphrose du néphron distal s'ensuivit avec hémoglobinurie, oligurie presque de l'anurie, avec urémie et acidose.

La cause apparente: une transfusion durant l'intervention. Après beaucoup d'attention et de soins, le patient s'est amélioré. L'auteur discute des indications opératoires de l'intervention mises d'avant par Sensenbach, même si cela paraît inusité, le diagnostic de "rein de Goldblatt" semble être indiqué ici.

ZUSAMMENFASSUNG

Es wird ueber den Fall eines jungen Mannes mit Sehstoerungen und hohem Blutdruck berichtet. Schwere Veraenderungen des Augenhindergrundes verbunden mit Blutdruckerhoehung erforderten eine urologische Untersuchung, die eine nicht funktionierende rechte Niere zutage brachte. Es wurde ein chirurgischer Eingriff unter der vorlaeufigen Diagnose einer "Goldbattniere" vorgenommen. Dabei fand sich eine retroperitoneale Echinokokkuszyste, die einen Druck auf die Nierengefaesse ausuebte. Die Gefaesse lagen innerhalb der Zystenwand. Die Niere und die Zyste wurden mittels einer recht schwierigen chirurgischen Technik entfernt.

Der postoperative Verlauf war stuermisch, da sich eine Nephrose mit Haemoglobinurie, fast voelliger Harnverhaltung, Uraemie und Azidose entwickelte. Die Ursache lag allem Anschein nach in einer waehrend der Operation verabfolgten Bluttransfusion.

Unter sorgfaeliger konservativer auf taegliche biochemische Untersuchungen sich stuetzende Behandlung wurde dieser aeusserst schwere Zustand ueberwunden. Jeder weitere chirurgische Eingriff, wie Auswaschung der Bauchhoehle, wurde vermieden, wiel der erschoepfte Patient dadurch haette gefaehrdet werden koennen.

Die Indikationen fuer d[illegible] werden eroertert. Sie [illegible]iff Einklang mit den von Sensen[illegible] stellten F[illegible] Die Dia[illegible]

"Goldblattniere" scheint in diesem Falle gerechtfertigt gewesen zu sein, wenn auch ihre Ursache recht ungewoehnlich war.

RESUMEN

Se comunica un caso de un joven con perturbaciones visuales é hipertensión arterial. Los cambios notables en fondo del ojo además de la hipertensión, determinaron una investigación urológica que descubrió un riñón derecho no-funcionante. La operación se realizó bajo el diagnóstico de presunción de "riñón de Goldblatt," habiéndose encontrado un quiste equinocóccico comprimiendo los vasos renales, que estaban situados en el interior de la pared del quiste. El riñón y el quiste fueron extirpados con dificultad.

El curso postoperatorio fué dramático conforme se desarrolló una nefrosis de nefrón inferior debida aparentemente a la transfusión sanguínea dada en la operación.

Mediante un bien meditado tratamiento conservador basado en determinaciones bioquímicas diarias, se pudo contrarestar el grave parecimiento. Se evitó cualquier intervención posterior tal como el lavado peritoneal, ya que podría haber puesto en peligro al agotado paciente.

Se discuten las indicaciones para esta operación que estan de acuerdo con los requerimientos establecidos por Sensenbach. El diagnóstico de "riñón de Goldblatt" pareció justificado, aunque la causa fué rara.

RIASSUNTO

Viene riferito il caso di un giovane con disturbi della vista e ipertensione arteriosa. Le gravi modificazioni del campo visivo e gli alti valori pressori consigliarono di studiare il malato dal punto di vista renale e si trovò un rene destro non funzionante. Si intervenne con la diagnosi provvisoria di "rene di Goldblatt" e si scoperse una cisti da echinococco retroperitoneale che comprimeva i vasi renali. Questi erano situati nella parete della cisti che fu asportata assieme al rene, con un intervento tecnicamente piuttosto difficile.

I sèguiti post-operatorii furono burrascosi: comparve una nefrosi con emoglobinuria, oliguria estrema, uremia e acidosi. La causa apparente fu una trasfusione intra-operatoria.

La situazione, assi grave, fu superata mediante una cura medica ben condotta—evitando ogni manovra chirurgica, compreso il lavaggio peritoneale che sarebbe stato nocivo a un paziente così grave.

La diagnosi di "rene di Goldblatt" sembra giustificata.

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Volvulus of the Midgut and Malrotation of the Intestine

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THIS paper offers certain conclusions drawn with regard to the treatment of malrotation of the intestine. These conclusions are based upon careful consideration of the 21 cases in which we have treated this condition over a period of six years. In general, it will be our purpose to emphasize, first, that the condition occurs more frequently than is generally recognized; second, that malrotation is not an unusual cause of the "acute surgical abdomen" in adults, and third, that, because of the high incidence of recurrence, volvulus of the midgut secondary to malrotation is most effectively treated by resection of the mobile intestine at the time of the original operative procedure. Before presenting the results of the present study, let us review the basic factors in normal rotation as described by many embryologists and clinicians.

"The alimentary tube grows at a faster rate than the celomic cavity from the sixth to the tenth week of embryonic life, and because of this, a portion of the midgut protrudes out of the abdomen into the umbilical cord. At about the tenth week, the peritoneal cavity grows more rapidly and the midgut is withdrawn into it. When the intestine recedes into the abdomen, it rotates in a counterclockwise direction. It is, therefore, evident that the post-arterial portion of the midgut, which includes the terminal ileum, cecum, ascending and transverse colon, lies wholly in the left side of the abdomen. The rotation continues until the cecum comes to lie in the superior part of the abdomen. By the eleventh week of fetal life, the cecum and first portion of the colon are in the epigastrium. The cecum passes into the right upper abdomen and then finally ends its migration in the right lower quadrant.

"After rotation is completed, the cecum and ascending colon attain peritoneal reflections and attachments in the right side of the abdomen. The mesentery of the small bowel likewise becomes attached to the posterior abdominal wall from the duodenojejunal junction obliquely downward toward the cecum" (Ladd and Gross[1]).

Any departure from this normal process of rotation and fixation should tend to produce an anomaly capable of precipitating a surgical emergency at any time during life. The pathologic condition encountered is either (1) exomphalos resulting from failure of the midgut to return to the abdominal cavity, (2) obstruction of the second portion of the duodenum, (3) volvulus of the midgut, or (4) a combination of these pathologic entities.

Results in Present Study.—The age and sex incidence in this study was interesting and revealing. Although it was true that some manifestation of malrotation tended to appear most frequently (33 per cent) in the first year of life, 57.1 per cent of the patients treated were adults. The youngest patient was admitted half an hour after birth; the oldest was [illegible] of age when treatment was instit[illegible] average age incidence was 22.4 [illegible] female sex prede[illegible] [illegible]d over [illegible] a ratio of [illegible]

Signs [illegible]

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followed a rather constant pattern. Abdominal pain, vomiting, and distention were the predominant signs and symptoms. When the condition was observed in older children and in adults there was usually a history of recurring attacks of *cramplike abdominal pain, vomiting, and* constipation, which had been present in varying degrees of severity throughout the patient's lifetime. Some patients significantly reported episodes of violent abdominal pain with shocklike symptoms, which were suddenly and spontaneously relieved before any diagnosis could be made. One patient had marked secondary anemia and had always been underweight. Gastrointestinal complaints were mild. The diagnosis was made by the radiology department.

The correct diagnosis was suspected preoperatively in most of the cases in which the patients were infants. The percentage of satisfactory diagnoses for adults increased as our experience broadened and the importance of obtaining a careful past history on both acutely and chronically ill patients became more obvious and we realized the necessity of looking for some manifestation of malrotation of the intestine in adults as well as in infants.

The radiology department was helpful in establishing a correct diagnosis. Roentgenographic studies of the gastrointestinal tract were performed in 16 of the 21 cases. The extent of the examination was variable, ranging from a simple scout film of the abdomen to thorough studies of the entire gastrointestinal tract. The results of barium enemas were misleading in cases of chronic recurrent volvulus, because the heavy barium stream occasionally produced reduction of the volvulus.

McGraw[2] has pointed out that the following observations in a film of the abdomen are significant, and we have found them extremely helpful:

1. The cecum is dilated and appears to be in an ectopic position.
2. Loops of small bowel, distended with gas, may be seen often lying to the right of the cecum.
3. The ileocecal valve may be demonstrated lying to the right of the distended cecum.
4. The spiral distortion of the mucous membrane may sometimes be seen at the site of twisting.

Note that all pathologic combinations were encountered in these cases (Table 1). One patient had complete exomphalos; 4 patients had disabling symptoms from a band obstructing the duodenum. (It may be added that this anomaly is often overlooked in adults.) A duodenal band with midgut volvulus occurred in 8 instances. A midgut volvulus without other demonstrable anomalies was encountered 10 times, twice in the same patient after the reduction of a volvulus and the division of a duodenal band.

TABLE 1.—*Conditions Diagnosed and Treated*

Exomphalos	1
Duodenal band	4
Duodenal band with midgut volvulus	8
Midgut volvulus	10
Total	23

(2 recurrences in 1 patient)

Treatment.—Early operation is the key to success in the treatment of persons with any of the various manifestations of malrotation of the intestine. The procedure employed may vary from the division of a simple band to the resection of a large portion of the intestine, and it is entirely dependent upon what is found when the abdomen has been opened. On inspection of the abdominal viscera, one of two conditions is observed: either the cecum lies in the right upper quadrant and the ascending or transverse colon is visible, or the small intestine is the presenting part of the alimentary tract and the ascending colon is hidden from view.

In the first instance, the duodenal obstruction may be relieved by incising the parietal peritoneum to the right of the cecum. However, when the small intestine presents and a midgut volvulus is encountered, there is a difference of opinion as to the most favorable method of treatment.

The various methods that have been employed in the operative management of

TABLE 2.—*Procedures Employed*

1.	Reduction of exomphalos, closure of ompthalocele	1
2.	Division of duodenal band	4
3.	Reduction of volvulus	4
4.	Reduction of volvulus; division of band	6
5.	Resection of postarterial portion of midgut; primary end-to-end ileotransverse colostomy	7
6.	Reduction of volvulus; division of band; resection of distal portion of ileum	1
	Total	23

(3 procedures for 1 patient)

malrotation with midgut volvulus are:

1. Reduction of the volvulus and division of the obstructing duodenal band.
2. Reduction of the volvulus, division of the obstructing duodenal band, and fixation of the malrotated intestine by suture.
3. Reduction of the volvulus, division of the obstructing duodenal band, and fixation of the malrotated cecum by appendicostomy or cecostomy.
4. Reduction of the volvulus and resection of the posterior portion of the malrotated midgut with primary end-to-end ileotransverse colostomy.

The effects of malrotation in this group of cases were treated by the procedures listed in Table 2. The "time order" sequence of these procedures is significant, in that evaluation of the available operative treatments changed with broader experience. This evolution can best be summarized by brief case studies selected chronologically.

CASE 1.—A baby 7 months old was admitted to the hospital with a history of vomiting, diarrhea and failure to gain weight. A barium study of the upper part of the gastrointestinal tract revealed an obstruction of the duodenum. A high-lying cecum and a duodenal band were observed at operation. The obstructing band was divided, and the cecum was allowed to swing free in the abdomen. Convalescence was uneventful, and a rapid gain in weight was recorded.

CASE 2.—A 6-year-old boy had had intermittant bouts of acute abdominal pain, vomiting, and constipation all his life. An enema always relieved the condition. On the day of his admission to the hospital this remedy failed. Physical examination revealed the child to be acutely ill, with a distended, tender, boardlike abdomen. At operation a midgut volvulus was reduced and an obstructing duodenal band divided. The patient's convalescence was without incident. His family reported that he had been in better health than at any time during his life. He died elsewhere, six weeks after the operation, from a recurrent volvulus.

CASE 3.—A 19-year-old housewife was admitted to the hospital with acute abdominal pain and vomiting. She had a tender, silent abdomen. A plain film revealed a pattern of small bowel obstruction, and at operation a midgut volvulus and an obstructing duodenal band were observed. The volvulus was reduced and the band divided. The patient convalesced normally but had a recurrent volvulus, which was reduced three months later. (In the interim, the patient in Case 4 was treated.) When the patient was again admitted with volvulus of the midgut, the viable postarterial portion of this segment was resected and a primary closed ileotransverse colostomy performed. She has remained well since.

CASE 4.—A nonviable midgut was resected from a 32-year-old nurse who was admitted to the hospital the night before Thanksgiving with acute abdominal pain and vomiting. The past history, obtained after operation, revealed many similar episodes, which had disappeared without treatment. Diagnosis and operation were delayed because the surgical staff was at a football game. Exploration that evening revealed volvulus of the midgut with three complete turns. The postarterial portion had long since lost its viability and was resected. Notwithstanding the poor treatment accorded her, the patient made a normal recovery and has enjoyed better health than at any time during her life.

The smooth convalescence and subsequent course of the patients in Cases 3 and 4 (after the third operation) led to the adoption of routine resection of the postarterial portion of the midgut for the treatment of both acute and chronic volvulus of the midgut. Five additional patients, in all age groups, have since been treated in this manner without mortality or recurrence. With the availability of blood and the wide choice of antibiotics now at hand, it is our opinion th
the safest and most satisfac
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less of its lity.

In this series of 21 cases there was 1 hospital death. This was secondary to the closure of a large omphalocele with complete exomphalos. One patient died elsewhere from recurrent volvulus six weeks after the reduction of a viable volvulus of the midgut.

SUMMARY

1. A study of 21 cases of malrotation of the intestine with volvulus of the midgut was undertaken.

1. Some manifestation of malrotation appeared in 33 per cent of the cases during the first year of life, although 57.1 per cent of the patients operated on were adults.

3. Preoperative roentgenographic studies were carried out in 16 of the 21 cases and were of great diagnostic value.

4. The pathologic aspects of malrotation of the intestine are briefly reviewed.

5. Studies of the operative procedures revealed three recurrences after reduction of the volvulus and division of a duodenal band. Resection of the postarterial portion of the midgut with primary ileotransverse colostomy was carried out in 7 cases without mortality or recurrence.

ZUSAMMENFASSUNG

1. Es liegt eine Untersuchung von 21 Faellen von Drehungsstoerungen des Darmes mit Volvulus des Duenndarms vor.

2. Gewisse Anzeichen einer bestehenden angeborenen Drehungsstoerung zeigten sich in 33% der Faelle schon waehrend des ersten Lebensjahres, obgleich 57,1% der Kranken erst im Erwachsenenalter zur Operation kamen.

3. Praeoperative Roentgenuntersuchungen wurden an 16 der 21 Patienten ausgefuehrt und erwiesen sich von grossem diagnostischen Nutzen.

4. Es wird ein kurzer Ueberblick ueber die pathologischen Grundlagen der angeborenen Drehungsstoerung des Darmes gegeben.

5. Eine Untersuchung der angewandten Operationsverfahren ergab 3 Rueckfaelle nach Reduktion eines Duenndarmvolvulus und Durchschneidung einer Zwoelffingerdarmverwachsung. Die Resektion des postarteriellen Duenndarmbschnitts mit primaerer Ileotransversostomose wurde in 7 Faellen ohne toedlichen Ausgang und ohne Rueckfall ausgefuehrt.

RESUMEN

1. Se emprendió un estudio de 21 casos de malrotación con vólvulus del intestino medio de la terminología embrilógica.

2. Aunque el 57.1 por ciento de los pacientes operados fueron adultos, aparecieron algunas manifestaciones de malrotacion en el 33 por ciento de los casos durante el primer año de la vida.

3. Se llevaron a cabo estudios roentgenográficos preoperatorios en 16 casos de los 21 y fueron de gran valor diagnóstico.

4. Se revisaron brevemente los aspectos patológicos de la malrotación intestinal.

5. Los estudios de los procedimientos quirúrgicos, revelaron tres recurrencias después de la reducción del vólvulus del intestino medio embriológico y división de una brida duodenal. En 7 casos se llevo a cabo la resección de la parte postarterial del intestino medio embriológico con colostomía ileotransversa primaria, sin moralidad ni recidiva.

RIASSUNTO

1. Sono state prese in esame 21 osservazioni di malrotazione dell‘intestino con volvolo dell'ileo.

2. Alcune manifestazioni della malrotazione comparvero durante il primo anno di vita nel 33% dei casi; il 57,1% dei pazienti operati erano adulti.

3. Venne eseguito uno studio radiologico preoperatorio in 16 casi, e fu di grande aiuto per la diagnosi.

4. Vengono riassunti brevmente gli aspetti anatomopathologici della malrotazione intestinale.

5. Lo studio degli operati rivelò 3 recidive dopo riduzione del volvolo e sezione di una briglia duodenale. Venne fatta in

7 casi una resezione della porzione post-arteriosa del tenue con ileo-colostomia primaria sul trasverso. Non vi furono morti operatorie nè recidive.

SUMÁRIO

1. Um estudo sôbre 21 casos de falta de movionentajão do intestino ocasionando volvulo, e trazido a lume.
2. Algumas manifestação dessa perturbação aparecem em 33% dos casos durante osprimeirosanosde vida, enquanto uma media de 57,1% dos doentes operados eram adultos.
3. E salientado o valôr do diagnostico radiologico preoperatório feito em 16 dos 21 casos.
4. São ligeiramente revistos os aspetos patologicos da falta de rotacão do intestino.
5. Estudos sôbre os processos operatórios empregados revelam 3 recidivas. Tambem a resseção após uma ileo-transverso-colostomia foi praticada em sete casos, sem registro de mortalidade ou recidiva.

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BECAS OTORGADAS POR EL CAPITULO ARGENTINO

En el transcurso del año 1952 el Capítulo Argentino ha otorgado 4 becas internas y 2 externas, las cuales fueron cumplidas en los siguientes servicios:

Instituto de Cirugía Torácica y de la Tuberculosis, Director Prof. Dr. Jorge A. Taiana:

2 becas internas
1 beca externa

Instituto de Medicina Experimental, Director Prof. Dr. Abel N. Canónico:

1 beca externa

Policlínico Ramos Mejía—Servicio del Prof. Dr. Normando Arenas:

1 beca externa

Policlínico Rawson-Servicio del Prof. Dr. Ricardo Finochietto:

1 beca externa

Policlínico Ramos Mejía—Servicio del Prof. Dr. Carlos M. Masco:

1 beca externa

Renal Ectopy

Report of a Case of Crossed Ectopy without Fusion, with Fixation of Kidney in Normal Position by the Extraperitoneal Route

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ANOMALIES of the kidney are of particular interest to the urologist, and a knowledge of them is of great importance. These may be of number, form, size, position, reciprocal relations, and of vascularization.

This presentation is concerned with congenital anomalies of position — namely, renal ectopia, the term applied to the kidney which is congenitally displaced and has never occupied its normal anatomic position. It is not to be confused with renal ptosis, an acquired displacement that usually manifests itself in adult life.

Embryologic Considerations. — In any study of a congenital anomaly, a consideration of the embryonic development of the involved organ is indispensable.

Originally the metanephros—the permanent embryonic kidney—is situated in the bony pelvis. When the embryo is 5 mm. long, these bodies are opposite the second sacral segment. Upward migration is rapid, and by the end of the second month of intrauterine life they are far from their original position, being opposite the first four lumbar vertebrae, and have established contact with the adrenal glands.

In its ascent the kidney changes not only its position but its orientation. While in the bony pelvis, it is placed in an anteroposterior position with the hilus situated anteriorly, and faces internally and externally. Its ascent is combined with rotation medially, which draws the hilus inward so that the kidney now faces anteriorily and posteriorly, its plane at this time being completely transversal. Later, growth of the vertebral bodies will push the hilus forward, changing slightly the preceding torsion and giving to the kidney its definitive orientation, slightly forward and inward.

During its ascent the kidney acquires its blood supply through temporary vessels which arise from the aorta, the common iliac arteries, the external iliac arteries, the middle sacral artery, and other neighboring vessels. The permanent circulation is not acquired until the embryo is from 25 to 30 mm. long.

If the normal migration of the kidney is for any reason interfered with, or its ascent is mechanically prevented by some anomaly of an adjacent organ that pushes the kidney out of its course, these temporary vessels may become permanent vessels, thus presenting the vascular abnormalities common in the ectopic kidney.

Because the normal migration of the kidney can be interrupted at any point in its course between the bony pelvis and the renal fossa, a great variety of displacements may occur. Ectopic kidneys are therefore found in the bony pelvis, in the iliac fossa, over the sacroiliac joint, or beside the last lumbar vertebrae. In a case mentioned by Lowsley the kidney was found in the thoracic cavity.

Incidence.—Renal ectopia is a relatively common anomaly, simple unilateral ectopy being the most frequent type. Campbell observed 72 cases in 47,477 autopsies, an

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incidence of 1:660. Rolnick and Eisendrath observed 205 cases in 207,321 autopsies (1:1,000).

In 3,285 urologic examinations Thomas and Barton discovered 6 cases (1:547), while Culp reported an incidence of 1:249 in 747 pyelographic studies.

Thomas and Pace, reviewing the records of the Mayo Clinic, found 97 cases; in 9 of these the condition was discovered at autopsy, and in the other 88 it was identified clinically—in 52 instances by urologic examination and in 36 by laparotomy. McKenzie and Hawthorne reported 13 cases in 15,000 admissions in their service. Herman, in his *Practice of Urology*, stated that 16.9 per cent of renal anomalies are renal ectopies. Lowsley and Kirwin, after reviewing the literature, placed the incidence at about 1 out of every 660 to 1,000 persons.

Types of Renal Ectopy.—The most common form of renal ectopy is *simple unilateral ectopy*, in the presence of which the kidney may be found at any point between its normal location and the base of the bladder.

Bilateral ectopy is very rare, Fowler having reported 40 cases from the literature up to 1941. The two kidneys may be found at the same level or at different levels. Fusion of the two is common.

In cases of *crossed renal* ectopy one kidney is displaced to the opposite side to a point below the other, which usually is in normal position. There are two varieties. In one the adjacent poles of the kidneys are fused, resulting in an oval mass or a superimposition of both kidneys (*crossed renal ectopy with fusion*). This is the most common form. In the other the kidneys are not fused and retain their anatomic and physiologic independence (*crossed renal ectopy without fusion*). Here, too, the displaced kidney is below the other one. Whether fusion is present or not, the ureter from the higher kidney pelvis enters the bladder on the corresponding side, while that of the transposed kidney crosses the midline and enters the bladder on the opposite side. Cystoscopically, therefore, both ureteral orifices appear in their normal positions.

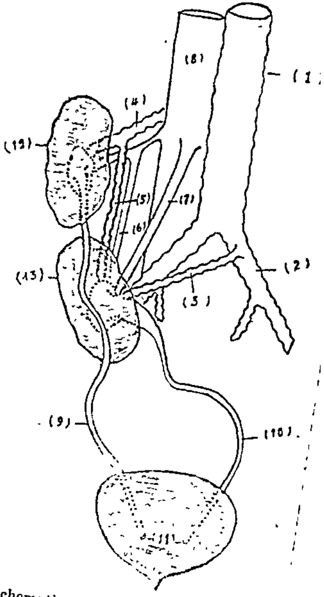

Fig. 1.—Schematic drawing showing condition present. *1*, aorta; *2*, left common iliac artery; *3*, left renal artery; *4*, right renal artery; *5*, superior polar artery to ectopic kidney; *6*, superior polar vein from ectopic kidney; *7*, renal vein from ectopic kidney; *8*, vena cava; *9*, right ureter; *10*, left ureter; *11*, ureteral orifices; *12*, right kidney; *13*, left (ectopic) kidney.

Crossed renal ectopy without fusion is an extremely rare condition. According to Harry P. Lee, in only 1 of every 10 cases of crossed renal ectopy is the anomaly of this type. Lee, reporting the twenty-ninth case in 1948, and after a careful review of the literature, tabulated 28 other undoubted cases (see table). To this is added the case presented here.

Of the 29 preceding cases, the
in 13 was observed in the cad
autopsy; in 12 it was diagnosed at

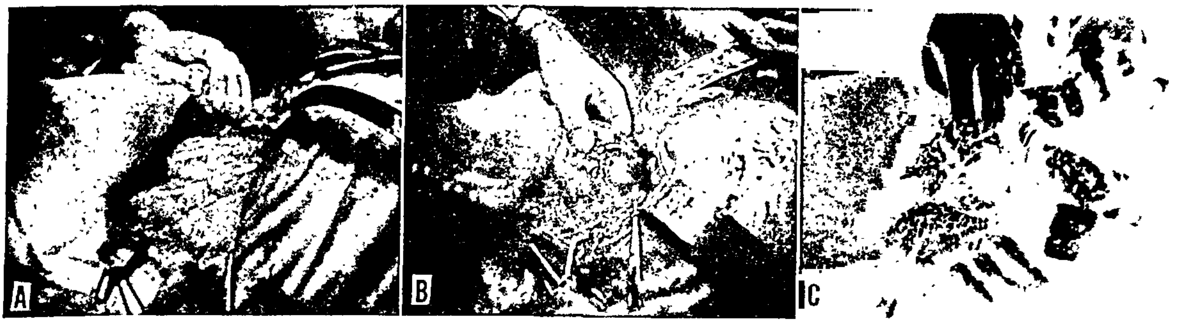

Fig. 2.—*A*, right lumbar incision. The left (ectopic) kidney can be seen lying immediately below the right kidney. *B*, vascular pedicle of the ectopic kidney: upper polar artery, a branch of the right renal artery; upper polar vein, a branch of the right renal vein; renal artery, originating from the left common iliac; renal vein, a branch of the vena cava, anterior aspect. When the vascular pedicle of the ectopic kidney has been freed *(C)*, transference of the kidney to its normal position in the left flank is prevented by the upper polar vessels which retain it on the right side.

tion, and in only 5 was it diagnosed pyelographically, All of the patients subjected to operation were treated by nephrectomy.

The rarity of this entity, together with the fact that this is the first case in which it has been treated by surgical fixation of the transposed ectopic kidney in its normal position, is the reason for this report.

Age; Sex; Side Affected.—Ectopic kidney is observed at every age. As this is a congenital malformation, it is probable that the given age refers not so much to the beginning of the illness as to the date of discovery of the anomaly. Ectopic kidney has been reported as occurring in a 2-year-old child and also in a man aged 55. Most of the patients have been between 20 and 30 years old, which can be readily understood, since in the early years the symptoms are usually minimal and do not require medical attention.

As to the sex incidence, the published reports show the anomaly to be more frequent in men than in women. However, some isolated reports show a preponderance in the female sex—for example, that of Fetter and Smith, who observed the condition in 7 of 10 patients of their own.

Although there is no apparent embryologic reason why one or the other kidney should be more disposed toward ectopy, the statistics show that the anomaly is more common on the right side.

Character of the Ectopic Kidney.—Alterations in the size and shape of the ectopic kidney are very common. Regularly it is smaller than normal. In form it may be flat, discoid, pyramidal, ovoid or, in some cases, lobulated. Generally the ectopy is accompanied by faulty rotation, so that the pelvis retains its embryonic anterior position. When not hydronephrotic, the pelvis is small and the formation of the calyces incomplete. In some cases, because of over-rotation, the pelvis faces anteriorly or lateralward. The ureter generally is short and tortuous, though not infrequently its course is straight and unobstructed.

A characteristic of the ectopic kidney is its vascularization, which is always anomalous. Depending on the place where the kidney is found, the vessels are derived from the inferior portion of the aorta, from the common iliac, the external iliac, the middle sacral, or the inferior mesenteric artery. Furthermore, the vessels are almost always more numerous.

Symptoms.—Many instances of renal ectopy have been discovered at autopsy or during routine urologic examinations, without having produced symptoms. Ectopic kidney should be thought of when there are indefinite gastrointestinal symptoms, a palpable mass in the lower part of the abdomen, or urinary disturbances—hematuria and pyuria.

The most prominent symptom is pain, which may vary from dull to sharp and colicky, depending on the pathologic conditions present. The pain is localized in the lower part of the abdomen, on the side of the displaced kidney. Radiation of the pain is not the rule, and when present is due to the presence of a stone or obstruction. Apparently the patient's position has no direct relation to the appearance of pain, since this occurs in both the prone and the upright position. In women, an increase in the pain is observed before or during menstruation.

Digestive disturbances may accompany the pain, and when the latter is very severe there may be vomiting and fever, as with acute appendicitis. When the gastrointestinal disturbances are marked and the pain is on the left side, the condition may resemble diverticulitis.

When the kidney is infected, there will be urinary alterations. Hematuria is a symptom which may well lead to the diagnosis. Fetter and Smith mentioned a case referred to them for cancer investigation in which microscopic hematuria was the only symptom; urologic examination revealed an ectopic kidney with marked functional impairment without infection.

Lowsley has stated that ectopic kidneys usually give no symptoms unless diseased, even though they drain defectively and are poorly nourished owing to the inefficiency of their anomalous vascularization. He adds that such kidneys are, however, readily affected and, in addition, are predisposed to functional impairment by reason of pressure exerted upon them by neighboring organs—the opposite kidney generally showing compensatory hypertrophy.

Diagnosis.—Suspected because of th symptoms, the diagnosis is easily con firmed by excretory urographic and retrograde pyelographic studies. At times, when urinary symptoms are absent, the ectopy may be discovered incidentally in the course of other studies. Palpation of a mass in the lower part of the abdomen may suggest the possibility of ectopic kidney, necessitating investigation of the urinary tract. A plain roentgenogram of the abdomen should be made, and if there is absence of a kidney shadow from its normal position, a urologic checkup becomes essential—its first step being excretory urographic investigation, by which the diagnosis is quickly made. Cystoscopic examination should be done, to determine the function of each kidney and to secure retrograde pyelograms. One may also determine the length of the ureter by this means—a most important point, because the ureter in a case of ectopic kidney is generally short, and this is one of the chief means of differentiating ectopy from acquired ptosis, in which the ureter is of normal length. Use of the cystoscope also permits inspection of the bladder, particularly of the ureteral orifices. Ordinarily these are in normal position because the ureter of the ectopic kidney enters the bladder at the normal point. Several pyelograms should be taken with the patient in

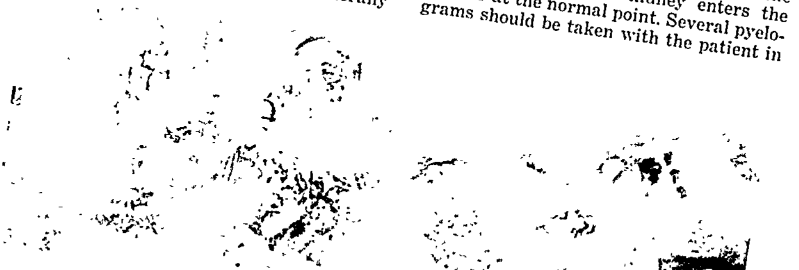

Fig. 3.—*A*, sectioning of the upper polar vessels, permitting transference of the kidn
flank. *B*, left lumbar incision. The ectopic left kidney has been transferred to the
an artificial renal bed created. Nephropexy by Deming's technic.

different positions, to determine the motility of the kidney and the length of its vascular pedicle.

In any acute abdominal emergency the differential diagnosis is of great importance. Urographic studies can usually be done with safety. Urinalysis may reveal pyuria, indicating infection, or red blood cells. The hemogram may disclose marked leukocytosis as a manifestation of an intra-abdominal suppurative process. Fetter and Smith cited some cases in which appendicitis was diagnosed but not confirmed at operation; also a case of gynecologic intervention in which a pelvic kidney was discovered. Jefferson in his gynecologic service routinely does urographic studies before pelvic surgical measures are undertaken—an excellent practice in view of the frequent coexistence of pelvic lesions and lesions of the urinary tract.

Treatment.—A careful analysis of the symptoms and diagnostic data should enable one to decide the course of treatment to pursue. Hydronephrosis, pyonephrosis, calculi, tumor, and other serious pathologic conditions indicate nephrectomy. On the other hand, if the symptoms are vague and the renal function acceptable, the patient may be treated expectantly until further observation confirms the need of nephrectomy.

Nonsurgical treatment consists of ureteral catheterization for the drainage of infected, obstructive lesions, with lavage of the renal pelvis and the use of chemotherapeutic and antibiotic agents. Such measures have a temporary effect.

Nephropexy and surgical correction of the obstruction can be accomplished in some cases, but are attended with considerable difficulty, and the results are not always satisfactory. Lowsley believes that if the ectopic kidney is situated above the iliac crest the defects of drainage may sometimes be corrected by mobilizing it sufficiently to fix it in a more normal position. He states that in the case of a pelvic kidney this cannot usually be done because the vessels are derived from the iliac and pelvic plexuses, preventing elevation of the kidney to the normal position.

Lowsley, as well as Rusche and Bray, advocates the transperitoneal route for nephrectomy. Mackenzie and Hawthorne have employed the extraperitoneal approach for pelvic kidney. Fetter and Smith also favor this route, utilizing the Gibson pararectal incision for the low lumbar, iliolumbar, and iliac kidney. Marion states that one should approach the kidney by whichever route is most convenient in the particular case: lumbo-iliac, ilio-inguinal, subperitoneal, or transperitoneal.

REPORT OF A CASE

A. C., aged 22 years, a half-breed soldier, was admitted to the Hospital Militar Central on July 7, 1951, because of pain in the right iliac fossa.

Four days earlier, after military exercises, he experienced severe pain in this region which increased daily in intensity and was accompanied by nausea, precordial anguish and constipation. He was admitted to the Hospital with these symptoms. The temperature was 37.5 C. (99.5 F.). The pulse rate was 74, and the blood pressure in millimeters of mercury was 110 systolic and 70 diastolic.

Physical examination by the admitting doctor revealed a depressible abdomen with a painful and slightly movable mass in the right iliac fossa. A provisional diagnosis of appendicitis was made, and the patient was placed under observation. A blood count taken on the following day was normal. Subsequently the patient was examined by the military surgeon, who suspected right renal ptosis. I was then called into consultation and agreed with this opinion. Further examination was accordingly directed to the urologic aspect. The nonprotein nitrogen blood test showed 0.38 Gm. per liter. Urinalysis disclosed many pus cells, altered leukocytes, bacteria and scattered cylindroids.

Excretory urograms were taken on July 19 (Figs. 7*A* and 8*A*). The plain film showed two renal shadows in the right flank but none in the left. The urogram failed to show excretion of dye or a renal shadow on the left side; but in the right flank were two renal pelves and two kidney shadows, one above the other. The shadow of the calyces overlay the pelvic

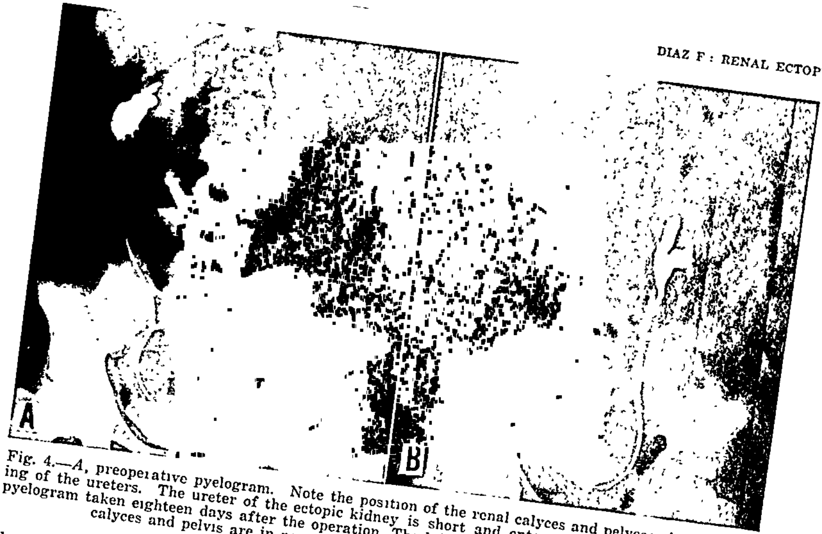

Fig. 4.—*A*, preoperative pyelogram. Note the position of the renal calyces and pelves; also the kinking of the ureters. The ureter of the ectopic kidney is short and enters the bladder normally. *B*, pyelogram taken eighteen days after the operation. The left crossed renal ectopy has been corrected; calyces and pelvis are in normal position. There is no kinking of the ureter.

shadow, indicating a rotation defect of the kidneys. The pelvis of the lower (left) kidney was dilated. The excretory ability of both organs was excellent. The ureters opened independently in the bladder, which had a normal appearance. The left ureter, which entered the bladder normally, was short and had a decided S-shaped kink. Pictures taken with the patient at an angle of 45 degrees showed a movable right kidney, descending to 1 cm. above the iliac crest, kinking the ureter. The left kidney also was movable and descended to the pelvis. A diagnosis of left crossed renal ectopy, probably without fusion, and right renal ptosis was made.

Because of the rarity of the anomaly, I presented the case to the Urological Service of the Hospital de la Samaritana, where retrograde pyelographic studies were done on August 3. Indigo carmine was injected, the color appearing in three minutes on the right side and in three and one-half minutes on the left. The bladder mucosa and the ureteral orifices were normal in appearance. Pyelographic study confirmed the urographic data (Fig. 4*A*). Also observed were spina bifida occulta and lumbarization of the first sacral vertebra, for six lumbar vertebrae could be counted.

The diagnosis having been established, the question now was what course to pursue. The patient at this time had no pain except on palpation. The ectopic kidney is known to be fragile, and a kinked ureter predisposes to hydronephrosis and in this case was responsible for the pelvic dilatation. After careful consideration, having thought over all the contingencies that might present themselves in the course of operation, I decided to intervene surgically. In view of the normal functional capacity of both kidneys and the appreciable length of the ectopic kidney's vessels, as judged by the motility of the organ which permitted its displacement from the lower part of the abdomen to the pelvis, I decided to attempt fixation of the ectopic kidney, with correction also of the right renal ptosis.

The transperitoneal approach wa. carded from the beginning, beca would suffice only for exploration, decided on an ample right lumbar in prolonged to t domen, wi rt th

*Crossed Renal Ectopy Without Fusion—30 Cases**

Author	Date	Crossed Kidney	Pathologic Complications	Relation to Normal Kidney	Sex of Patient	Method of Diagnosis
Rokitansky	1861	L	None	Below	F	Cadaver
Weisbach	1867	L	None	Below	M	Autopsy
Brigidi	1880	L	None	Below	M	Autopsy
Graser	1895	L	Pyonephrosis in ectopy	Below	M	Surgery, autopsy
Schultz	1897	R	None	Below	F	Autopsy
Kohler	1900	L	Chronic nephritis	Below	F	Autopsy
Schumacher	1903	L	None	Below	F	Autopsy
Ghosal	1905	L	None	Above	F	Autopsy
Heiner	1908	L	None	Below	F	Autopsy
Plummer	1910	L	Not given	Below	M	Surgery
Bugbee and Losee	1919	L	Pyelitis in ectopy	Below	F	Pyelogram
Bugbee and Losee	1919	Both	Tuberculosis right; pyelonephritis left	——	F	Autopsy
Huffman	1924	L	None	Below	M	Cadaver
Beer	1925	L	Calculus and pyonephrosis in ectopic kidney	Below	M	Pyelogram, surgery
Alcock	1926	L	Calculus and pyonephrosis in ectopic kidney	Below	M	Pyelogram, surgery
Campbell	1930	L	Hypoplasia in ectopy	Below	M	Autopsy
Wear	1930	L	Hydronephrosis in ectopy	Below	F	Surgery
Sigal	1934	L	None	Below	M	Surgery
Howard	1935	R	Hydronephrosis in ectopy	Below	M	Surgery
Mayers	1936	L	Calculus in ectopy; bilateral pyelitis	Below	M	Pyelogram, surgery
Beer and Ferrer	1937	L	Hydronephrosis and calculus in ectopic kidney	Below	M	Pyelogram, surgery
Beer and Ferrer	1937	R	None	Below	F	Autopsy
Patch	1937	L	Adenocarcinoma in ectopy	Below	M	Pyelogram
Harris	1939	L	None	Below	M	Surgery
Langworthy and Drexler	1942	R	Adenocarcinoma in ectopy	Below	M	Surgery
Zide and Maher	1943	R	None	Below	M	Pyelogram
Culp	1944	L	None	Below	M	Pyelogram
Nation	1945	R	None	Below	M	Autopsy
Lee	1948	R	Carcinoma in ectopy	Below	F	Pyelogram, surgery
Diaz F., Gabriel	1952	L	None	Below	M	Pyelogram, surgery (fixation in normal position)

*First 29 cases from tabulation of H. P. Lee, J. Urol. *61*, February 1949.

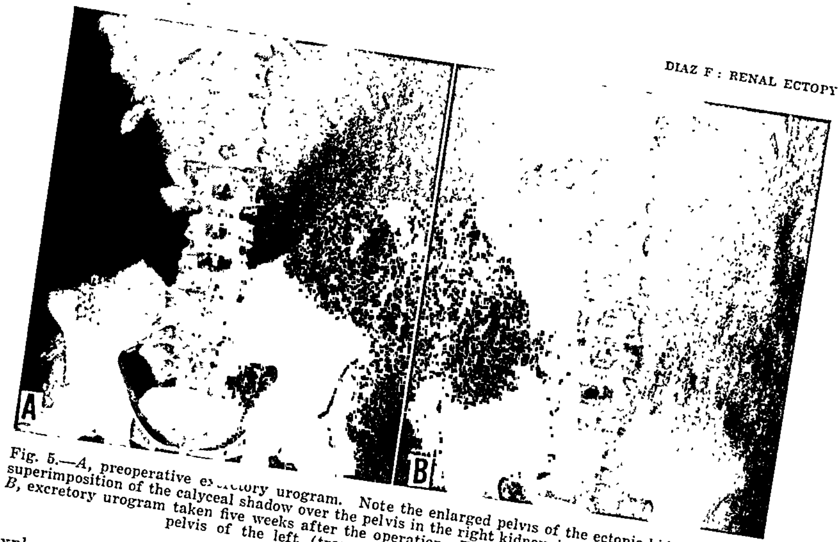

Fig. 5.—*A*, preoperative excretory urogram. Note the enlarged pelvis of the ectopic kidney, and the superimposition of the calyceal shadow over the pelvis in the right kidney, indicating a rotation defect. *B*, excretory urogram taken five weeks after the operation. Excretion is normal on both sides. The pelvis of the left (transposed) kidney drains normally.

exploration of the kidneys. If these were found to be fused, one of two things could be done: the symphysis might be destroyed as in the treatment of horseshoe kidney, or nephropexy of the entire mass might be performed to correct the renal motility and ureteral kinking. If they were not fused, I intended to elevate the right kidney, then explore the left pedicle and, depending on its length and where the arteries were given off and the veins emptied, either elevate the kidney on the right side or transpose it to its normal position, separating all of the posterior peritoneum as far as the left flank and creating the renal bed. With the kidney in its proper position, the wound would be closed, a left lumbar incision made, and a left nephropexy performed by the Deming method.

Operation was, therefore, undertaken on August 16.

Technic of Operation.—With the patient in the left lateral decubitus position and in hyperextension, a right lumboiliac incision was made extending from the last rib, 3 fingerbreadths from the midline, to 4 cm. under the anterior superior iliac spine. This was deepened through the muscular planes, bleeding vessels being ligated. The posterolateral peritoneum was separated carefully from the posterior muscular plane in the entire extent of the wound, exposing the kidneys, one below the other, surrounded by a small amount of fatty tissue. Both organs were isolated completely, no fusion being observed. The ureter of the upper kidney passed in front of the lower kidney and adhered to its anterior surface. This ureter was separated in all its extent down to its insertion in the bladder, its blood and nerve supply being left intact. The ureter of the lower (ectopic) kidney was then freed in a similar manner. This ureter described a sharp kink, first pursuing a downward course for 4 cm., then bending to the left and crossing the midline, then again coursing downward to enter the bladder normally.

Separation of the posterior parietal peritoneum was next continued beyond the midline, exposing the aorta, the vena cava, and their branches. At this point it was necessary to ligate many small vessels. The right kidney's vessels—artery and vein—were then freed. The artery was given off from the aorta at the normal level, inclined slightly downward and, in the middle of its course, gave off a branch to the ectopic kidney. The vein entered the vena cava normally, taking an oblique upward and inward direction, and receiving in the middle of its course a vein from the ectopic kidney. The right renal vessels entered the kidney on its posterior aspect, indicating a rotation defect, the inner and outer borders of the kidney having, consequently, become the posterior and anterior aspects.

Next, the vessels of the ectopic kidney were carefully freed. These were found to be as follows: a principal artery, which originated from the anterior aspect of the common iliac artery and took a direction obliquely downward and to the right; an upper polar artery—a branch of the right renal artery; a principal vein, which coursed obliquely upward and inward and entered the vena cava on its anterior aspect; an upper polar vein—a branch of the right renal vein. The renal pelvis was posterior to the vascular pedicle. In this ectopic organ, also, the vessels reached the kidney on its posterior surface, the anomalous rotation changing the direction of the borders so that they faced anteriorly and posteriorly. The bifurcation of the aorta was observed to be at a higher than normal level.

Because of the constitution of the pedicle and the length of the main vessels, fixation of the kidney in the normal position seemed feasible. Since there was no left renal bed, it was necessary to prepare one. This was done by very careful further separation of the posterior parietal peritoneum until the left flank was reached.

The renal vessels and the ureters being free, all that was now necessary was to transfer the ectopic kidney over the posterior abdominal wall from behind the peritoneum to the left flank. Two difficulties, however, presented themselves: the superior polar artery and vein were short and fixed the kidney to the right. Recalling the rich anastomosis of the renal circulation, and considering the normal caliber of the principal vessels, I unhesitatingly sectioned the polar vessels, giving the kidney the necessary motility. Trans-

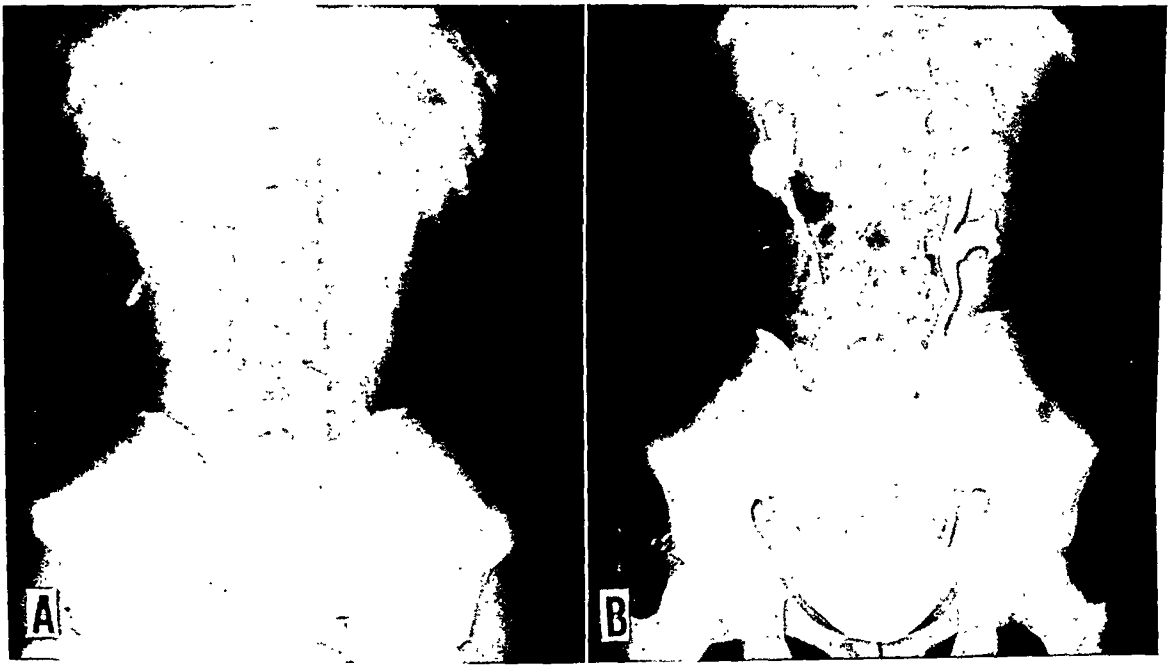

Fig. 6.—*A*, preoperative urogram taken thirty-five minutes after intravenous injection, with the patient at an angle of 45 degrees. Excretion is ending, and the great descent of the right kidney can be seen. The ectopic kidney cannot be seen because it is in the bony pelvis. *B*, postoperative pyelogram with the patient at an angle of 45 degrees, showing slight and normal downward displacement of the renal pelvis. (In all of these films one can see the lumbarization of the first sacral vertebra and the spina bifida occulta).

posing the kidney to its normal position and orientation produced a kinking of the pedicle—the artery, arising from the anterior aspect of the left common iliac, and the vein, emptying into the anterior aspect of the vena cava, communicated with the external border of the kidney, impeding drainage. The kidney was, therefore, rotated around its longitudinal axis from right to left, thus making the posterior aspect the anterior, with the pelvis emerging from the inner border and anterior to the pedicle, the normal position. The kidney was then slipped into the flank without kinking of its pedicle.

A right nephropexy was performed by the Deming method, and the wound was closed in layers, with a Penrose drain inserted.

The patient's position was then changed to the right lateral decubitus with hyperextension. A large left lumbar incision was made. When the peritoneum was reached, the left kidney could be seen in the lumbar fossa, as if it had always been there. By inspection and palpation it was verified that the circulation was satisfactory and the ureteral contractions normal. The kidney was then elevated by a Deming nephropexy and the wound closed in layers, with a Penrose drain in position.

The operation took five hours and fifty minutes and was performed with the patient under cyclopropane inhalation anesthesia with tracheal intubation. At the beginning of the operation the blood pressure in millimeters of mercury was 148 systolic and 72 diastolic; at the end, 118 systolic and 70 diastolic. During the procedure 1,200 cc. of blood and 1,500 cc. of 5 per cent dextrose in saline solution was given.

The operation is illustrated in Figures 2 and 3.

Postoperative Course.—During the first postoperative days the patient was given 2,000 cc. of 10 per cent dextrose in distilled water by venoclysis daily, 1 Gm. daily of streptomycin and 400,000 units of penicillin. The output of urine was between 1,500 and 2,000 cc. daily. The temperature rose to 38.2 C. on the third day and declined to normal on the seventh day. The blood pressure ranged from 140 to 70 systolic and from 120 to 65 diastolic.

The nonprotein nitrogen blood test showed 0.57 Gm. per liter on the fourth day and declined to 0.24 Gm. per liter on the twentieth day. At the time of the latter test, the patient had been having a normal diet for about two weeks.

Results of Operation.—Retrograde pyelographic investigation was done eighteen days after the operation (Figs. 4*B* and 6*B*). Injection of indigo carmine showed appearance of the dye on both sides in three minutes.

Examination of the urine from each kidney showed the following values:

	Right	*Left*
Urea, Gm. per liter	4.5	3.6
Chlorides (NaCl), Gm. per liter	6.0	5.9
Sediment, small hematic quantity on both sides		
*p*H reaction	6.5	6.7

Microscopic examination of the centrifuged specimens showed, on both sides, many red blood cells (especially normocytes), a few leukocytes, and some pavement cells. There were no cylindroids or renal cells.

Pyelographic study revealed the right kidney in normal position, with the calyceal shadow superimposed on the pelvic shadow, indicating faulty rotation of the organ in the same degree as had been noted in the preoperative pyelogram. The left kidney was placed lower than normally, owing to its short ureter. Its calyces and pelvis were normal. The ureteral kink seen in the preoperative film had been completely corrected, as had the left crossed renal ectopy.

A urogram taken five weeks after the operation showed both kidneys in proper position and functioning normally. Excretion by both parenchymas began simultaneously. The right calyceal shadow was superimposed on the pelvic shadow; the left renal pelvis was normal and the superior calyces well visualized.

At the last checkup, nine months after the operation, the nonprotein nitrogen blood test showed 0.24 Gm. per liter.

SUMMARY

1. A case of crossed renal ectopy without fusion is described, the thirtieth to be reported in the literature. This is the

seventeenth case in which the diagnosis was made during life, and the sixth in which the diagnosis was made pyelographically and surgically. It is the first recorded case in which surgical correction of the crossed renal ectopy was accomplished by fixation of the transposed organ in its normal position.

2. The technic of the operation is described.

3. The results of the operation have been satisfactory, as shown by urographic checkup.

4. The subject of renal ectopy is briefly reviewed as to causation, frequency, type, age and sex incidence, character of the ectopic kidney and its vascularization, symptoms, diagnosis and treatment.

Author's Note: I wish to express my grateful appreciation to Dr. Oswald S. Lowsley, of the Oswald Swinney Lowsley Foundation, Inc., of St. Clare's Hospital, New York, for his encouragement and advice in the preparation of this report.

RESUMEN

1. Se describe un caso de ectopia renal cruzada sin fusión, el treinta en el órden de los comunicados en la literatura, el diecisiete en que el diagnóstico fuá hecho durante la vida y el sexto en que el diagnóstico fué hecho por pielografía y cirugía. Es el primer caso registrado en el cual la corrección quirúrgica fué realizada por la fijación del órgano transpuesto en su posición normal.

2. Se describe la técnica de la operación.

3. Los resultados de la operación han sido satisfactorios como muestra el estudio urográfico.

4. Se revisa brevemente el tema de la ectopia renal, etiología, frecuencia, tipo, edad y sexo, carácter del riñón ectopico y su vascularización, síntomas, diagnóstico y tratamiento.

SUMÁRIO

1. Um caso de ectopia renal transversa é apresentado, sendo dêsse tipo, a 30° da literatura. Foi o 17° caso em que o diagnostico foi feito durante o periodo de vida, e o 6° em que a diagnose foi feita por meio da pielografia e da cirurgia. Foi o primeiro caso em que a correção da ectopia transversal foi completada pela fixação do orgão transposto em sua posição normal.

2. E apresentada e descrita a técnica da operação praticada.

3. A urografia, posterior, demonstra que os resultados operatórios foram satisfatórios.

4. O problema da ectopia renal é resumidamente revisto quanto á sua etiologia, frequencia, tipo, idade e sexo (incidencia), caracteristica do rim ectopico e sua vascularização, sintômas, diagnostico e tratamento.

RIASSUNTO

1. Descrizione di un caso di ectopia renale crociata senza fusione, il 3° della letteratura. E' il 17° con diagnosi fatta intra vitam, e il 6° in cui la diagnosi sia stata fatta chirurgicamente e pielograficamente. E', infine, il primo caso in cui si ottenne la correzione chirurgica dell'ectopia mediante fissazione dell'organo trasposto nella sua sede normale.

2. Descrizione della tecnica operatoria.

3. Verifica radiologica dell successo dell'intervento.

4. Breve rassegna dell'argomento nella sua etiologia, frequenza, tipo, età, sesso, caratteri del rene ectopico e sua vascolarizzazione, sintomi, diagnosi e cura.

ZUSAMMENFASSUNG

1. Es wird ein Fall von gekreuzter Nierenektopie ohne Fusion, der dreissigste bisher in der Literatur berichtete, beschrieben. Dies ist der siebzehnte Fall, in welchem die Diagnose waehrend des Lebens gemacht wurde, und der sechste, in dem die Diagnose pyelographisch und chirurgisch gestellt wurde. Im vorliegenden Fall wird zum ersten Mal das Gelingen der chirurgischen Korrektur einer gekreuzten Nierenektopie durch Befestigung des verlagerten Organs in seiner normalen Lage berichtet.

2. Die Technik der Operation wird beschrieben.

3. Der Erfolg der Operation war befriedigend, wie durch urographische Nachuntersuchung nachgewiesen wurde.

4. Der Gegenstand renaler Ektopie wird in Bezug auf Aetiologie, Haeufigkeit, Typus, Beteiligung des Alters und Geschlechts, Art der Gefaessversorgung der ektopischen Niere, Symptomatologie, Diagnose und Behandlung einer kurzen Betrachtung unterzogen.

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Advantages of the Biesenberger Technic for Mammaplasty of Hypertrophied Pendulous Breasts

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A subject so highly specialized as plastic surgery of the breast should be presented on the basis of a thorough investigation of the literature and an unbiased evaluation of the data so obtained. This, together with considerable personal experience and observation of actual work of many authors whose technics will be mentioned, serves as the basis of this presentation. I propose to deal with technics and end results, and only subjects pertinent to the accomplishment of these factors will be discussed.

It is common knowledge that reference to plastic surgery of the breast dates as far back as 1669 (Durstan and Emmery). The next earliest treatise is that of A. Velpeau in 1857, *Cosmetic Operation of Breasts*. The first use of the word mammaplasty was noted by Giraldes in 1851. The next author on the subject whose name is still mentioned was Gaillard Thomas (*Mammaplasty*, 1882).

From about 1898, when Michel and Pousson published their experiences, until the present time the literature has become voluminous with discussions, technics, and reports of cases of correction of hypertrophic pendulous breasts.

Needless to say, every surgical operation is based primarily on the anatomic, physiologic and pathologic conditions involved. The pathologic aspects of the pendulous hypertrophic breast may be disregarded here, since this paper is concerned only with benign hypertrophy. The only indications for surgical intervention are discomfort and psychic disturbance. Cosmetic deficiency is of great importance, but that presents another type of indication for surgical treatment.

The physiologic aspect of such breasts may be discounted at once. Voluminous breasts seldom function normally, and to expect them to assume a normal function after reduction would be to expect a miracle. This, then, immediately eliminates one frequent question—the question whether this technic or that will preserve the function of the breast.

The third aspect, the anatomic, based upon anatomic dissections and observations, is well known. The normal anatomic picture is also common knowledge. However, in 1939, Anson and Wright reported in detail a special study of the blood supply of the normal mammary gland. The evidence presented by Anson and Wright, together with my personal practical experience, causes me to favor their conclusion. Kaufman of Paris has also studied the blood supply of the breast by means of injected solutions opaque to the roentgen ray, and his conclusions also conform to those of Anson and Wright.

Although a normal anatomic picture serves as a basis for surgical procedures, it can be readily seen that, when there is a massive enlargement such as presents itself in the hypertrophic breast, there is a definite alteration in the blood supply to that breast. I agree with Bames' statement that study of the ordinary vascular

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supply to the breast does not have much value, because the blood supply to the hypertrophied breast is notoriously abnormal and deficient. It is for this reason that I have begun a series of experiments on the blood supply of the pendulous hypertrophic type of breast. This will soon be published under the title, "The Normal Blood Supply of the Abnormal Breast." With this conclusion, I hope to prove that some technics for resection of certain sections of the mammary gland carry more probability of necrosis than others. The basis of this article is in large measure derived from this very fact.

A comparative analysis of the various operative technics, their advantages and disadvantages, is therefore in order. Several minor points of difference must first be clarified. These points are based upon unanimity of opinion and are named only to be eliminated and so to avoid repetition.

First, all agree that a normal breast, as to size, location, appearance, minimal scarring and the presence of a normal-appearing areola, is the primary consideration. Next, the judgement of the surgeon must determine whether the single-stage or multiple-stage operation is indicated in a particular case. Everything else being equal, the condition of the patient must be considered first and foremost. Next, the result of the operation must be evaluated. Then comes the decision as to which technic will give the best results, all factors being given equal consideration.

It is assumed that symmetry of size, location and shape is dependent upon personal taste. Obviously the size will vary with the age, weight, height and general stature of the patient.

The location is also more or less standardized. The means of arriving at that location is another individual matter. Some surgeons employ complicated geometric measurements; some go by rule of thumb; some go by artistic comparison, and others judge by practical experience. No exception will be taken to any of these methods. The method by which one obtains the best results is the one to use.

It goes without saying that, whatever argument is presented for the use of any certain technic, one thing may be assumed —that the areola and nipple will have a reasonable chance of survival. This is the most important of all the requirements. All other mishaps, such as errors in size, location or shape, can be readjusted later. If, however, the areola and nipple are lost, the possibility of obtaining a normal-appearing breast is ended. It is true that tattooing and labial transplants have supplied a slight resemblance to an areola, but that is far from satisfactory. The closest copy of a real areola and nipple that I have been able to construct was made by taking a dermatome graft of the remaining good areola and nipple and placing it as a free graft on the side on which these structures were destroyed.

Before the comparison of the various technics is continued, there is one more type of operation that must be eliminated. This is operation for correction of gigantic breasts, which can be reduced only by almost complete mammary amputation. For this type of breast there is only one treatment of the areola and nipple, and that is a free transplant of these structures' according to the technic of Dr. Max Thorek. The operations of Pousson, Verchere, Morestin and Kausch are not considered, because these surgeons resect only a part of the breast without transposing the areola and nipple. De Quervain's operation is objectionable because the entire breast is separated from the pectoral fascia, which endangers the entire circulation; it is impossible to place the areola and nipple in a suitable position, and the cutaneous covering is in folds above if the breast is raised sufficiently high. Kuster's operation is also dangerous, because it jeopardizes the entire blood supply if the incision is made over half a circle, and it does not permit locating the areola and nipple in a suitable position.

In order to obtain a satisfactory result with the pendulous breast it is necessary not only to resect the gland tissue but to transpose the areola and nipple. Since most large breasts fall into this category, the technics for this type of operation are the ones to be considered.

The underlying principles of the type of mammaplasty under discussion consist in detachment of the skin about the areola by means of a circular incision, permitting the areola and nipple to remain attached to the gland substance; transposition of the same through a circular opening in a selected location, and suturing it into place.

One of the technics frequently used for this type of mammaplasty is that of Lexer-Kraske. In this operation a bottle-shaped incision is made, with the base at the center of the inframammary line and the neck surrounding the areola. This section of skin is removed. The flaps are undermined. A section of the gland is removed from the inferior pole. The areola and nipple are transposed into their new location. The gland substance is sutured; the skin is trimmed to fit and sutured. This operation is limited to hypertrophy of the round type of breast. It is safe because resection is done in a neutral area, where only the terminal branches of supply are sectioned.

Hollander's operation is similar, except that the section of breast tissue is removed from the lateral aspect of the breast. This technic is also limited to special types of enlargement. The scar is placed laterally and is more conspicuous than the inframammary incision. Actually this is the previously described operation performed on the side.

Passot's operation is based on resection of the lower pole. This also limits the usefulness of the technic to a special type of pendulous breast, in which the upper part of the breast is flattened, so that, when the areola is transposed, fullness is restored. If too much gland tissue is resected, there is danger of necrosis. The contour of the breast is not satisfactory.

Joseph's operation is too cumbersome. He makes a pedicle of the inferior pole, with the areola and nipple as one end of the pedicle, and transposes this end into its new location. After a variable period of time the submammary incision is reopened and the gland tissue resected. This procedure is too long, requires several stages, and results in a "pancake" type of breast.

Axhausen was the first to achieve complete exposure of the gland by entirely undermining the skin. In this manner he was better able to transpose the entire breast. However, he does not remove a section of the gland. He simply removes as much tissue from the upper surface of the gland, as he thinks necessary. This of course, limits the amount of breast tissue that can be resected. Extreme care must be used, because there is always danger of damage to the circulation.

Gillies and McIndoe have used several types of resection, including a technic in which they resect the medial side of the breast. This, in my opinion, is always dangerous, because of the possible injury to what is probably the main blood supply. They have used a double pedicle flap with resection of the segment from the superior pole and also from the inferior pole. I am hesitant about resecting more than a very small segment of the superior pole, because of the very real danger associated with injury of both sources of blood supply and the inability to produce an esthetically good result except when the breast is of the very small, flabby, slightly ptotic type. Lateral resections performed by these surgeons conform in every detail to the Biesenberger technic. In 1934, when I discussed the Biesenberger technic with Gillies, he informed me that he had been doing that procedure for some time. To my mind, this technic is by far the most advantageous one for the pendulous hypertrophic type of breast. My reasons are as follows: First, it is my contention that the main part of the circulation to the breast comes from the perforating branches of the internal mammary artery. Certainly the medial half of the breast is supplied by them. If the lateral half of the breast is sacrificed, therefore, the medial half should be amply supplied.

Second—a very important point which has received no attention—is the fact that the medial side of the breast is more firmly attached to the chest wall. This is conducive to better circulatory exchange among the smaller superficial and deep vessels.

Third, the skin covering the entire breast laterally *and to a less degree medially* is elevated from the gland tissue. This permits a perfect exposure, so that deliberate accurate section of the breast can be made.

Fourth, traction on the lower pole in the midline while the breast is being *sectioned enables one to visualize the tissue* as a flap to compare with that remaining on the medial side of the upper pole.

Fifth, since the medial upper pole is still attached to the chest wall and the circulation intact and continuing to the inferior pole, merely rotating the pedicle *in no way interferes with the circulation.*

Sixth, as the new position of the gland to the upper part of the chest is accomplished, it is sutured to the chest wall as well as to the medial half of the breast, thereby eliminating all dead space. This prevents secondary sagging, and one does *not depend upon the skin to maintain* the breast in position.

Seventh, since this is a single, compound open pedicle with the areola at its midpoint, it may be noted that the areola and nipple can be placed at any desired position without difficulty. When this is done, one needs but to cut an opening of the proper size to permit its extrusion at the proper location without pulling.

Eighth, by manipulation of this pedicle one can make either a flat or a conical breast.

Ninth, the skin covering may be cut to fit exactly. The cutaneous scar resembles an inverted T and, with careful suturing, may be very satisfactory.

In my opinion, in view of the aforementioned facts, mammaplasty *for hypertrophied* pendulous breasts may most advantageously be done by the Biesenberger technic.

SUMMARY

The advantages of the Biesenberger technic for mammaplasty of the hypertrophied pendulous breast are presented, on the basis of personal experience and a study of the available literature. Chronologic records of the development of mammaplasty are included, as is a review of *the facts relative to the anatomic,* physiologic and pathologic aspects of this type of breast.

The accepted normal circulation serves as a basis of the technic for mammary operations.

Technics that do not involve *transposition of the areola and nipple are eliminated.* The author presents an analysis of the accepted technics that include resection of gland tissue and transposition of the areola and nipple. The reasons for the comparative advantages of the Biesenberger technic are listed.

RÉSUMÉ

L'auteur rapporte sa technique personnelle et fait un relevé de la littérature sur les avantages de la technique de Biesenberger pour la chirurgie plastique *mammaire du sein pendulum.* L'auteur passe aussi en revue l'anatomie, la physiologie et la pathologie du sein. La circulation normale due rein est à considérer dans cette technique.

SUMÁRIO

São apresentadas as vantagens da técnica preconizada por Biesenberger para a plástica da mama hipertrofiada e em pendulo, o que faz o autôr baseado em sua propria experiencia, bem como na literatura publicada sôbre o assunto. Faz uma revisão das estatisticas referentes a plastica da mama, bem como da anatomia, fisiologia e patologia da glandula.

A circulação normal aceita serve de base *para a técnica ds operações sôbre a* mama. As técnicas que não compreendem a transposição da areola e do mamilo são afastadas. O autôr apresenta uma analise de todas as técnicas aceitas, incluindo a resseção do tecido glandular com transposição da areola e do mamilo.

Enumera, por fim, os motivo los quais a técnica de Biesenberge vantegens sôbre as demais.

RESUMEN

Se presentan las ventajas de la técnica de mamoplastía de Biesenberger para senos hipertróficos y péndulos, sobre la base de experiencia personal y estudio de la literatura disponible. Se incluyen registros cronológicos del desarrollo de la mamoplastía así como una revisión de los hechos relativos a la anatomía, fisiología y patología en este tipo de senos.

La circulación normal aceptada sirve como base de la técnica para operaciones en el seno.

Se eliminan las técnicas que no comprenden la transposición de areola y pezón. Los autores presentan un análisis de las técnicas aceptadas que incluyen resección de tejido glandular y transposición de la areola y el pezón. Se dan las razones para las ventajas comparativas de la técnica de Biesenberger.

RIASSUNTO

Vengono descritti i vantaggi della tecnica di Biesenberger per la plastica della mammella ipertrofica pendula, sulla base di una esperienza personale e dello studio della letteratura disponible. Viene fatta la storia dello sviluppo della operazione e uno studio della anatomia, fisiologia e anatomia patologica dell'affezione.

Come base alla tcnica dell'intervento viene presa la circolazione normale della mammella. Vengono scartate le tecniche che non comportano la trasposizione dell'areola e del capezzolo. L'autore presenta una analisi delle tecniche in uso che includono la resezione del tessuto ghiandolare e la trasposizione dell'areola e del capezzolo. Vengono elencate le ragioni della preferenza del metodo Biesenberger.

ZUSAMMENFASSUNG

Die Vorzuege der Biesenbergerschen Technik der Mammaplastik bei hypertrophischen Haengebruesten werden auf Grund eigener Erfahrung und der vorliegenden Literatur dargestellt. Die Arbeit enthaelt chronologische Aufzeichnungen ueber die Entwicklung der Mammaplastik und einen Ueberblick ueber die anatomischen, physiologischen und pathologischen Eigenheiten dieses Typus der Brustdruese.

Als Basis fuer die Technik von Brustoperationen dienen die anerkannten normalen Kreislaufverhaeltnisse.

Techniken, die auf eine Verpflanzung der Areola und der Brustwarze verzichten, werden verworfen. Die Verfasser analysieren die anerkannten Techniken, die die Resektion von Druesengewebe und die Verpflanzung der Areola und der Brustwarze einschliessen. Die Gruende fuer die Vorzuegs der Biesenbergerschen Technik im Vergleich mit anderen werden aufgezaehlt.

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A New Concept of Tracheotomy

Prevention of Pulmonary Complications and Asphyxia

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THE HISTORY of medicine is replete with references to the impressive role of tracheotomy in the development of surgery. No other operation combines such technical simplicity with such dramatic results, and no surgical procedure has been more effective in distinguishing the early surgeon from the charlatans of his period. Asclepiades of Prusa in Bythinia is credited with the performance of the first successful tracheotomies over two thousand years ago.[1] Even in the dark Middle Ages, medical students at the University of Padua received a detailed description of the surgical technic, including the use of a silver cannula, from their great Professor of Anatomy and Surgery, Fabricius of Aquapendente.[2]

Throughout its long period of development, this operation has been employed countless times for an increasing variety of conditions in different fields of medicine. All physicians are familiar with the indications for tracheotomy in obstructing lesions of the *upper* part of the respiratory tract, and they are described fully in the standard textbooks. Recent developments in surgery, such as the advent of endotracheal anesthesia and the introduction of antibiotic agents, have widened the surgical horizon and created new indications for tracheotomy. Radical surgical treatment of the head and neck calls for the provision of an airway which cannot be occluded by clots or inflammatory swellings during the postoperative course. A prophylactic tracheotomy evolved as the solution to this problem; it materially reduces the mortality of extensive procedures about the head, mouth, and neck, and decreases the period of postoperative morbidity in these cases.

During the past few years, tracheotomy has also been used successfully in the treatment of an increasing number of entirely different conditions which are characterized by an obstruction of the *lower* respiratory passages. The purpose of tracheotomy in these cases consists in the removal of obstructing secretions from the tracheobronchial tree and in the prevention of pulmonary complications and asphyxia. This new development has caused added interest in the procedure, since it affects not only the laryngologist but the general surgeon, the neurologist, the neurosurgeon, the thoracic surgeon, the orthopedic surgeon, the anesthesiologist, the obstetrician and—above all—the internist and the pediatrician. While the importance of this new approach may eventually surpass the original purpose of the operation, these newer indications for tracheotomy are not mentioned in any current textbook on otolaryngology, and appear virtually unknown outside the United States of America.

The basic pathologic picture associated with obstructing lesions of the upper part of the respiratory tract is easy to comprehend. It consists of a gradual narrowing of the airway, with characteristic signs and symptoms demanding prompt surgical intervention. Tracheotomy was designed to bypass this obstruction and thus prevent suffocation. By contrast, the
a tracheotomy for the prevention

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The basic pathologic physiology in all cases of secretory obstruction consists in failure of the cough mechanism, which normally clears the respiratory passages of accumulated secretions. This cough mechanism consists of five phases: inspiration, closure of the glottis, increase in intrathoracic pressure, opening of the glottis, and sudden expiration with release of intrathoracic pressure. Afferent impulses of the cough reflex arise from the larynx, trachea and bronchi and are transmitteed by the vagi to the brain stem; efferent impulses go to the muscles of inspiration and expiration and to the glottis. Any interruption of this reflex arc, by coma or severe general debility, by depression or destruction of the respiratory center in the medulla, by anesthesia of the larynx, by paralysis of the diaphragm or intercostal muscles, by fractures of the ribs or cervical spine, or by any other cause, abolishes the cough reflex.

This physiologic deviation is followed by a rapid accumulation of secretions in the lower segments of the respiratory passages, with increasing obstruction of the airway. The obstructing material always contains accumulated tracheobronchial secretions; but in the presence of coma, severe debility or pharyngeal paralysis, nasopharyngeal and salivary secretions, feedings and vomitus are aspirated and make up the bulk of the viscid substance. This is not surprising, when one remembers that the daily amount of salivary secretion alone is between 1,000 and 1,500 cc.[3]

While the etiologic factors may vary, the results of this secretory obstruction are strikingly similar. *Locally,* the accumulated material causes obstruction, edema, spasm of the bronchioles and scattered areas of atelectasis, which provide fertile culture media for any bacteria. This close relation between atelectasis and pneumonia has been demonstrated beyond doubt by Coryllos and Birnbaum.[4] If a large amount of fluid is permitted to accumulate, the patient may eventually drown in his own secretion.

Systemically, the secretory obstruction of the respiratory passages produces complex and far-reaching effects on every part of the body. Gray[5] has given a detailed description of the physiologic changes progressing from a decrease in the vital capacity to a reduction in the alveolar ventilation. This hypoventilation in turn produces progressive chemical changes in the blood, culminating in death by asphyxia.

Grodins and his associates[6] have shown that asphyxia is composed of three different elements: anoxemia, hypercapnia, and acidemia. The first, anoxemia, is the direct result of the reduced gaseous exchange in the alveoli. The effects of anoxemia or anoxia are well known and include an increase in capillary permeability, pulmonary edema, and damage of the central nervous system and cardiac tissues. The latter are also weakened directly by the increased respiratory effort. Galloway[7] has stressed the narrow margin between oxygen want and disaster by affirming that three to eight minutes of anoxia are likely to produce widespread damage and necrosis of the brain cells or death. He has further pointed out that repeated brief periods of anoxia may produce profound and lasting mental changes, even though the patient survives.

While this lack of oxygen devitalizes the tissues, a second phenomenon takes place. Carbon dioxide, because of its greater molecular weight, diffuses even less readily than oxygen and is thus retained in the blood. This hypercapnia has not received due attention in the past; yet my own experience and that of my associates fully supports the theory that the effects of hypercapnia are even more disastrous than those of anoxia. Hypercapnia produces headaches, restlessness, apprehension, disorientation, and uncooperativeness in its early stages, while high concentrations induce narcosis, anesthesia, respiratory depression, and circulatory collapse. Our own clinical tests and those of Plum and Wolff[8] confirm the experimental observations of Blalock and his associates,[9] that in the presence of respiratory obstruction hypercapnia may reach dangerous proportions, while the oxygen saturation is still satisfactory.

Coincident with the production of anoxemia and hypercapnia, there is a fall in the *p*H of the blood, completing the triad of asphyxia (Fig. 1). Carbon dioxide is retained in the blood as free carbonic acid. Since the *p*H of the blood depends largely on the equilibrium between free and combined carbonic acid, any excess of the former causes a gradual shift to the acid level. This process is known as respiratory acidemia, because it is due to an interference with the normal gaseous exchange in the lungs. It is distinguished by a high carbon dioxide combining power. In addition, severe anoxemia results in the production of excess lactic acid in the tissues, with an accumulation of lactic acid in the blood. In the presence of both metabolic and respiratory acidemia, little or no compensation takes place and a severe form of acidosis develops (Fig. 2). This electrolyte acidosis reinforces the action of the other chemical forces and hastens the onset of coma.

Finally, it should be mentioned that the local and systemic effects of secretory obstruction are largely interdependent. These vicious cycles (Fig. 3) rapidly increase the asphyxia and lead to a standstill in respiration. This detailed description of the physiopathologic picture associated with secretory obstruction explains the futility of even the most heroic measures after the vital centers have been damaged. Conversely, it provides concrete evidence of the necessity for timely and decisive action and determines the cations for a successful treatment.

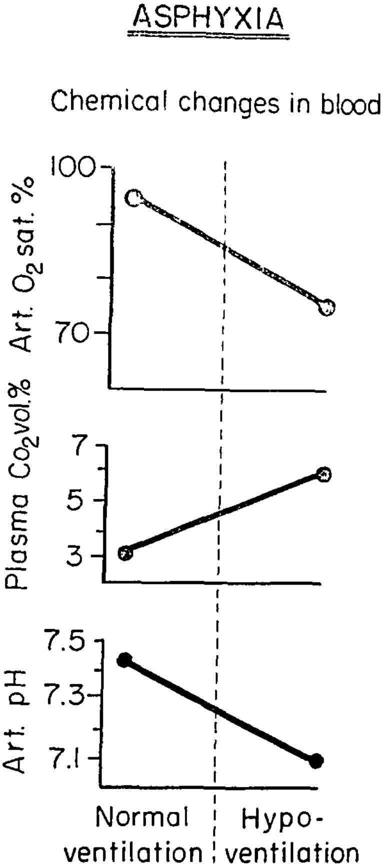

Fig. 1.—Chemical changes associated with asphyxia. Scheme illustrates decrease in arterial oxygen saturation, increase in carbonic acid, and shift of *p*H to the acid level during hypoventilation.

While the administration of oxy

plays an important part in the treatment of any respiratory disorder, it must be remembered that this element is no universal remedy for respiratory obstruction. A graph (Fig. 4) demonstrates the action of oxygen in asphyxia and shows that it is of no value in reversing the hypercapnia and acidemia. From the same diagram it should be obvious that the administration of carbon dioxide is actually harmful in the treatment of asphyxia. Sedatives are also contraindicated, since they have a tendency to reduce the respiratory effort even further.

The only treatment providing any real hope of success consists in removal of the obstructing secretion from the respiratory passages and reestablishment of normal alveolar ventilation. The aspiration can be accomplished through a bronchoscope, an endotracheal tube, or a tracheotomy cannula. Bronchoscopic inspection and aspiration is the recognized treatment in cases of mild secretory obstruction, in which a single evacuation of the respiratory passages produces the desired effect. It is contraindicated for critically ill patients and for the severe forms of secretory obstruction in which the tracheobronchial tree must be aspirated as often as every fifteen minutes.

Endotracheal intubation is advocated only as an emergency procedure to maintain a patent airway or to administer artificial respiration during the performance of a tracheotomy. If left in place for more than a short period, the large endotracheal tube causes irritation of the pharynx and larynx, with considerable discomfort to the patient. Damage of the

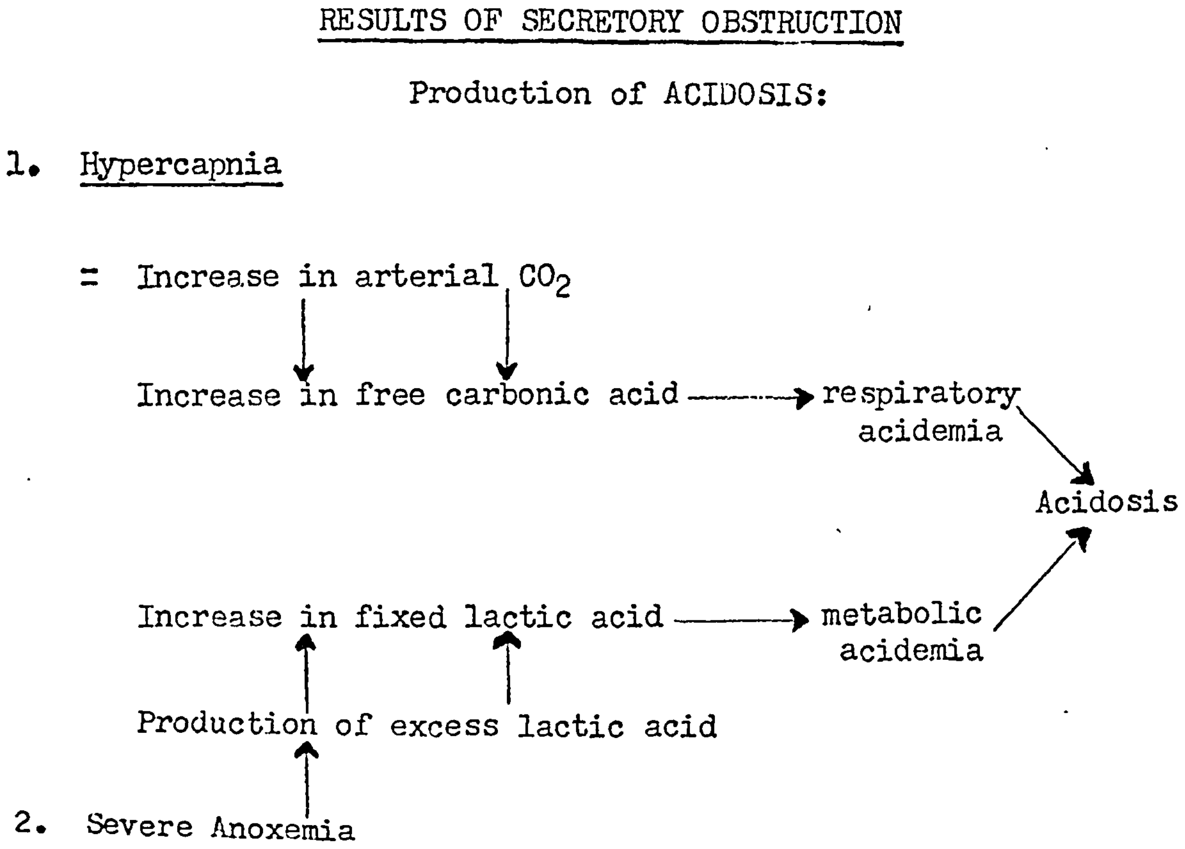
RESULTS OF SECRETORY OBSTRUCTION
Production of ACIDOSIS:
1. Hypercapnia
= Increase in arterial CO2
Increase in free carbonic acid
respiratory acidemia
Acidosis
Increase in fixed lactic acid
metabolic acidemia
Production of excess lactic acid
2. Severe Anoxemia

Fig. 2.—Development of acidosis in the presence of secretory obstruction. Strong respiratory acidemia, due to accumulation of carbon dioxide, is reinforced by metabolic acidemia resulting from tissue anoxia.

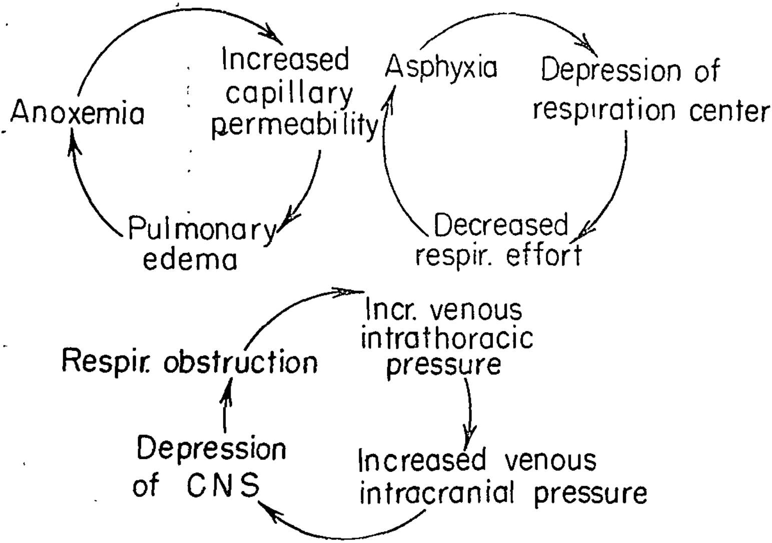
Anoxemia
Increased capillary permeability
Pulmonary edema
Asphyxia
Depression of respiration center
Decreased respir. effort
Respir. obstruction
Incr. venous intrathoracic pressure
Increased venous intracranial pressure
Depression of CNS

Fig. 3.—Cumulative action of destructive forces in the presence of secretory obstruction. Vicious cycles demonstrate the interdependence of local and systemic effects.

delicate laryngeal structures often prolongs the morbidity and necessitates a secondary tracheotomy or additional laryngeal operations. Aspirations through an endotracheal tube require constant expert attendance, and crusts or clots are difficult to remove in this manner. The presence of a soft rubber airway also tends to create a false sense of security, which may lead to serious or fatal consequences if a sudden kink in the rubber tube occludes the airway.

It is my opinion that a tracheotomy is the treatment of choice for all critically ill patients and whenever repeated aspirations appear probable. In these cases, tracheotomy is the only form of therapy that meets all of the existing requirements: it bypasses any obstruction of the upper part of the respiratory tract, permits easy and continued aspiration of the lower part by untrained personnel, facilitates the removal of crusts and tenacious secretions by irrigation, relieves the exhaustion of the patient, and eliminates the necessity of performing repeated bronchoscopic aspirations. Moreover, the opening into the trachea provides a short cut which decreases the dead space of the respiratory tract by about 50 per cent, and permits the delivery of fresh air or oxygen directly to the lower part of the respiratory tract.

Accordingly, during the past few years we have employed tracheotomy in the treatment of patients with secretory obstruction, in an effort to prevent secondary pulmonary complications and asphyxia. In the early cases the respiratory embarrassment had been permitted to reach the critical stage, and immediate evacuation of the obstructing secretions was essential to keep the patient alive. Recently, we have extended our indications to include prolonged operative procedures in old and debilitated patients, in the hope of forestalling pulmonary involvement. As Coryllos[10] has proved experimentally, each case of asphyxia presents an individual problem, and the indications for surgical intervention should be related to the underlying disease and the general condition of each patient. The following clinical manifestations may serve as guide lines for the performance of a tracheotomy in cases of secretory obstruction: Respiratory distress as evidenced by recurring attacks of cyanosis, moist rales, or laryngeal stridor; inability to cough effectively, pharyngeal pooling of mucus, and prolonged coma or stupor with aspiration of pharyngeal secretions. In doubtful cases, I perform an initial bronchoscopic aspiration; if this results in temporary relief, a tracheotomy is clearly indicated.

Since the treatment of secretory obstruction by tracheotomy was first advocated by Galloway[11] for cases of bulbar poliomyelitis, other investigators focused their attention chiefly on this disease. Extensive reports by Galloway and his colleagues,[12] by Wilson, [13] and by Priest and his associates[14] provide much detailed information on tracheotomy in bulbar poliomyelitis; their good results have been duplicated by several other authors.[15]. A short case history illustrates our own results with this type of treatment in a serious case of bulbar poliomyelitis:

CASE 1.—A 16-year-old boy was admitted to the hospital with a history of vomiting, dysphonia, dysphagia, and low grade fever, of two days' duration. An examination of the chest on the morning after admission gave negative results, but several hours later severe respiratory distress developed and the patient lapsed into stupor. A quick examination revealed marked cyanosis, no response to stimulation, inability to cough, and grunting respirations. The chest was filled with moist rales, and breath sounds were restricted to the upper portion of one lung. Aspiration of the trachea and bronchi through a tracheal spatula improved the breathing temporarily. A tracheotomy was performed without delay, and large amounts of secretion were aspirated at frequent intervals for several days. Breathing and color improved immediately after the operation, and the patient became alert and cooperative. He was able to swallow small sips of water on the seventh postoperative day, and was discharged on the twenty-first postoperative day, fully recovered.

In tetanus similar indications for tracheotomy prevail, although repeated attacks of laryngospasm may add to the respiratory distress. A number of successful tracheotomies in this dread disease have been described in the recent literature,[16d] which includes a report by two of our residents[16′] on 6 cases. The following case history provides a typical illustration of the value of tracheotomy in tetanus:

CASE 2.—A 65-year-old Negress was admitted to the hospital with a history of pain in her left lower teeth for two weeks, and dysphagia for five days. Her jaws were clamped tightly together in trismus; edema and tenderness were present over the left mandible. Twelve hours after admission, generalized tonic contractions were noted and a diagnosis of tetanus was established. In spite of the immediate administration of intravenous tetanus antitoxin and rectal and intravenous sedation, recurrent attacks of laryngospasm produced an accumulation of secretions in the respiratory tract, with periods of cyanosis. Postural drainage and suction through a rubber catheter resulted in temporary improvement, but on the second day after admission irregular respirations developed, and the patient lapsed into coma. A tracheotomy was performed, and copious amounts of tenacious secretion were aspirated at frequent intervals through the tracheal cannula. All generalized spasmodic contractions ceased with the establishment of an effective airway, although the trismus persisted for another two weeks. Recovery was uneventful; the tracheotomy cannula was removed as soon as the patient was able to overcome the tetanic spasm of her jaw muscles, and she was discharged two weeks later with no residual symptoms.

Pulmonary involvement is a common complication of injuries of the head, cervical spine, and chest; secretory obstruction often follows such injuries, with rapid deterioration of general resistance and death from asphyxia. To prove the value of tracheotomy in this type of case, Echols and his associates[17] have just re-

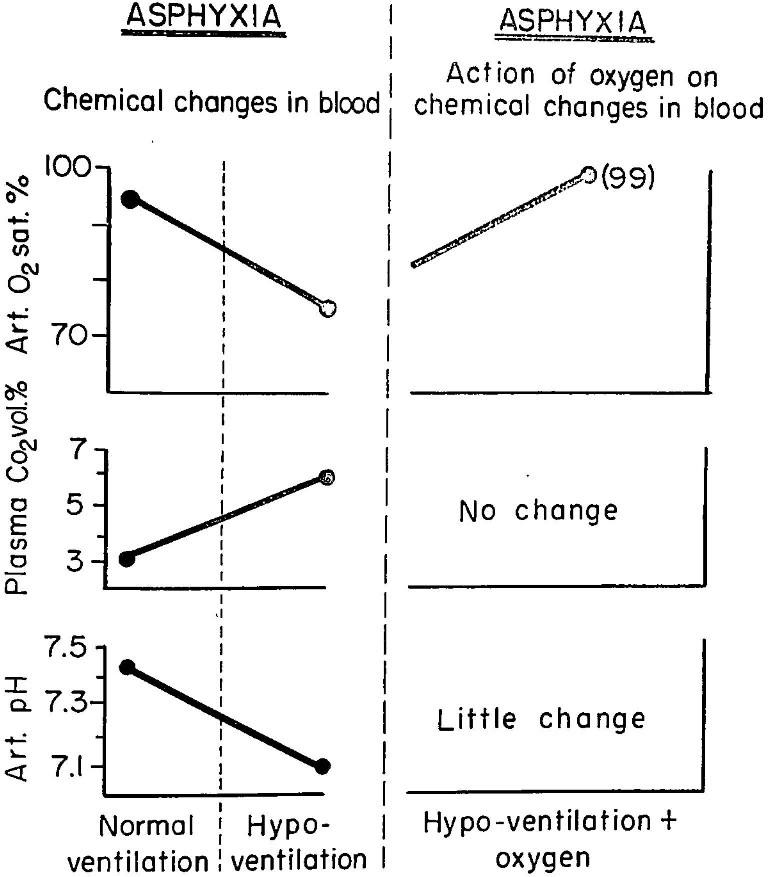

Fig. 4.—Action of oxygen in the presence of asphyxia. Oxygen therapy improves oxygen saturation, if airway is patent, but has no appreciable effect on hypercapnia or acidemia.

ported excellent results in the management of severe head injuries and after extensive brain operations. Our own efforts to prevent pulmonary complications in neurosurgical patients have been equally encouraging. I have also been much [illegible] sed with the good results obtained [illegible] otomy for crushing injuries [illegible] in these cas [illegible] there [illegible] n deaths twofold purpose of tracheotomy in the treatment of crushing injuries of the chest, for the aspiration of blood and clots in the early stages and for maintenance of a clear airway during convalescence, forms the basis of a separate paper.[18] One of the case histories is presented here to emphasize the importance of timely surgical intervention:

CASE 3.—A 10-year-old girl was admitted to the hospital with a crushing chest injury after an automobile accident. On admission her general condition was described as poor; the pulse rate was 160 and the respiratory rate 40, and the skin was pale and clammy. Examination further disclosed a concave depression of the anterior chest wall, paradoxical movements of the chest during the respiratory cycle, and moist rales throughout both lung fields. In spite of oxygen therapy and blood transfusions the patient became steadily worse; five hours after admission cyanosis had developed, and there was marked respiratory embarrassment. Although elevation of the depressed fragment of the anterior chest wall by a sternal pin restored normal chest contour and excursions, respiratory difficulties continued. After tracheotomy large amounts of blood and secretion were aspirated from the trachea and bronchi, with immediate improvement in respiration. On the third postoperative day an unforeseen complication arose: the traction pin tore out of the sternum and had to be replaced by wire loops. This episode was followed by the sudden development of cyanosis, necessitating an immediate bronchoscopic examination and the removal of several large tenacious clots. Further recovery was uneventful, and the tracheotomy cannula was removed on the ninth postoperative day.

Thermal injuries may also require surgical intervention by tracheotomy. Blast burns destroy the superficial layer of the tracheobronchial lining and inhibit normal ciliary activity. Goltz[19] has agreed that aspirations through a tracheotomy cannula are most effective in removing crusts and dried secretions and in preventing respiratory obstruction. Similarly, interruption of the normal self-cleansing mechanism by extreme cold calls for the same treatment. The following case history is representative of such injuries:

CASE 4.—A 55-year-old man was admitted to the hospital after he had been rescue a blaze in his living room. Examinati closed hemiplegia of the right arm a with loss of speech—the result of a p cerebrovascular accident—and severe of the forehead, back and extremitie admission, the patient's general conditi described as poor, and all medical me failed to reverse the development of Twenty-four hours later progressive r tory distress developed, with moist rale ble throughout both lungs. Aspiration trachea and bronchi by means of a catheter was followed by temporary im ment, but dyspnea and cyanosis so curred. A bronchoscopic examination di acute inflammation of the larynx, trache bronchi; the mucous membrane lining structures appeared bright red, ulcerate covered with a heavy white exudate. aspiration was followed by so much relie a tracheotomy was performed, and crus secretion were aspirated through the c at regular intervals. No further respi difficulties were encountered, but urina tention developed and the patient died following day.

Tracheotomy is also indicated in cases of cerebrovascular disease acute neurologic disorders, in which is prolonged respiratory embarrass The following case report serves a example of these conditions:

CASE 5.—A 19-year-old Negro was ad to the hospital with a recent history of throat and with dysphagia, dysphonia, numbness of the face and hands of less twenty-four hours' duration. Observatio admission included nystagmus, pharynge laryngeal paralysis, and diminished ref Other neurologic signs developed in sho der; the patient soon became unable to c and required frequent tracheal aspiratio control rapidly developing asphyxia. A tr otomy was performed, and during the ten days the patency of the airway was tained by regular aspirations through tracheotomy cannula. A diagnosis of di inated encephalomyelitis was established three and a half weeks later the patien dismissed after subsidence of the neur symptoms.

The incidence of postoperative p nary complications has been discusse peatedly since Lee, Tucker, and C

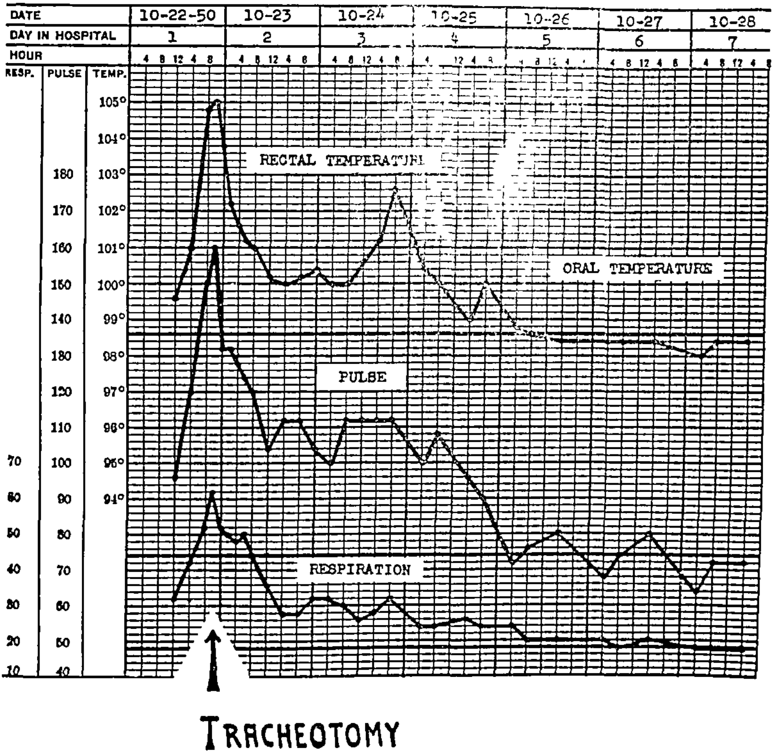

Fig. 5.—Tracheotomy in a case of secretory obstruction. Graphic chart represents course of patient with barbiturate poisoning and secretory obstruction (Case 8).

first observed the constant occurrence of viscid bronchial secretions in cases of postoperative atelectasis. Henderson[21] has shown that after a major operation the vital capacity is often decreased by 50 per cent, and Haight[22] has stressed the necessity of preventing retention of bronchial secretion in postoperative patients. I agree with Atkins[23] and Arhelger[24] that it is often advisable to perform a prophylactic tracheotomy immediately after an operation on an old and debilitated patient; the same applies after extensive surgical or neurosurgical procedures on the head and neck. A short case history exemplifies the effectiveness of a tracheotomy in the management of postoperative pulmonary complications:

CASE 6.—A child aged 2 years
was admitted to the hospital
of dyspnea and cyanosis, and
nosis of tetralogy of **Fallot**. Th

with a variety of conditions, including bulbar poliomyelitis, tetanus, brain injuries, cerebrovascular accidents, drug poisonings, crushing chest injuries, myasthenia gravis, blast burns, and postanesthetic or postoperative complications.

Experimental studies of the physiopathologic picture in these cases indicate the far-reaching systemic and local effects of secretory obstruction, leading to death or permanent disability. Physiologic therapy consists of restoration of the airway, with facilities for constant removal of secretions; in cases of prolonged obstruction this is usually best accomplished by tracheotomy.

The timely treatment of secretory obstruction by tracheotomy affords new opportunities to improve the hopeless prognosis of many serious diseases and injuries.

ZUSAMMENFASSUNG

Die heutige Auffassung des Luftroehrenschnittes zieht eine grosse Gruppe von Erkrankungen auf allen Spezialgebieten der Medizin in den Kreis der Betrachtungen ein. Die Stellung der Tracheotomie als lebensrettender Eingriff ist durch die Hinzufuegung zahlreicher neuer Indikationen und durch die Verwendung moderner physiologischer Grundsaetze weit ausgebaut worden.

Erstickungszustaende als Folge von Sekretverstopfungen der Luftroehre und der Bronchien koennen bei vielen verschiedenen Krankheitszustaenden auftreten. Dazu gehoeren die bulbaere Kinderlaehmung, Tetanus, Hirnverletzungen, Schlaganfaelle, Arzneimittelvergiftungen, Quetschverletzungen der Brust, Myasthenia gravis, Explosionsverbrennungen und nach Narkose oder Operationen auftretende Komplikationen. Experimentelle Untersuchungen des physiopathologischen Bildes in solchen Faellen weisen die umfangreichen systemischen und oertlichen Folgen sekretorischer Blockierung nach, die zum Tode oder zu endgueltiger Invaliditaet fuehren koennen. Die physiologische Behandlung besteht in Wiederherstellung der Luftpassage und in der Schaffung der Moeglichkeit, die Absonderung staendig aus Dem Wege zu schaffen; bei zeitlich ausgedehnten Verstopfungen wird dies gewoehnlich am besten mit Hilfe des Luftroehrenschnittes erreicht.

Die rechtzeitige Behandlung der Verstopfung der Luftwege durch Sekrete mit Hilfe der Tracheotomie bietet neue Moeglichkeiten, die hoffnungslose Prognose vieler schwerer Erkankungen und Verletzungen zu verbessern.

RESUMEN

El concepto actual de la traqueotomía implica una amplia variedad de padecimientos en cualquier especialidad de la medicina. El papel salva-vidas de la traqueotomía ha sido extendido por la adquisición de nuevas y numerosas indicaciones y por la aplicación de principios fisiológicos modernos.

La asfixia debida a obstrucción traqueobronquial por secreciones, puede ocurrir en gran variedad de padecimientos, incluyendo poliomielitis bulbar, tétanos, traumatismos cerebrales, accidentes vasculares cerebrales, envenenamiento por drogas, traumatismos torácicos por aplastamiento, miastenia gravis, quemaduras y complicaciones postanestésicas y postoperatorias.

Estudios experimentales de la imagen fisiopatológica en estos casos indican los efectos locales y sistómicos de la obstrucción por secreciones, principalmente hacia la muerte ó la incapacidad permanente. La terapeútica fisiológica consiste en la restauración del conducto aéreo con facilidades para la constante remoción de secreciones. En la obstrucción prolongada esto se logra generalmente mejor por la traqueotomía.

El tratamiento temprano de la obstrucción secretoria por la traqueotomía da una nueva oportunidad, para mejorar el pronóstico sin esperanza de muchas enfermedades y traumatismos graves.

RIASSUNTO

Il concetto moderno di tracheotomia si estende a una vasta gamma di condizioni in ogni campo della medicina. Il compito di salvare la vita, affidato alla tracheotomia, si è allargato per l'aggiunta di altre indicazioni e per l'applicazione di moderni concetti fisiologici.

L'asfissia da occlusione tracheobronchiale secretoria può presentarsi in molte malattie fra cui la poliomielite bulbare, il tetano, traumi e accidenti vascolari cerebrali, avvelenamenti, traumi da schiacciamento del torace, miastenia grave, ustioni da scoppio, complicanze post-anestetiche e post-operatorie.

Lo studio sperimentale fisiopatologico di questi casi ha dimostrato i rapidi effetti generali e locali della occlusione bronchiale secretoria, che conducono alla morte o alla invalidità permanente. La cura fisiologica consiste nel ripristino della permeabilità all'aria e nell'allontanamento continuo delle secrezioni; nelle occlusioni prolungate tutto ciò si ottiene nel migliore dei modi con la tracheotomia.

La cura delle occlusioni secretorie mediante tracheotomia porta nuove speranze al miglioramento della prognosi, un tempo disperata, di molte gravi malattie e traumi.

SUMÁRIO

O atual conceito da traqueotomia, envolve uma pronunciada variedade de assuntos, ligados a todas as especialidades da Medicina.

O papel salvadôr da traqueotomia foi consideravelmente aumentado pela adição de inumeras indicações novas, e, bem assim, pela aplicação dos principios fisiologicos modernos.

A asfixia devida a obstrução traqueobronquica de origem secretória, pode se observar em diversos quadros, inclusive na poliomielite bulbar, no tetano, nas lesões cerebrais, nos acidentes vasculares cerebrais, nos envenenamentos, nos esmagamentos do torace, na miasteniax grave, nas queimaduras extensas e nas complicações posoperatorias ou post-anestesicas.

Estudos experimentais do quadro fisiopatologico nêsses casos demonstra a larga extensão e os efeitos locais da obstrução secretória, causando a morte ou a incapacidade permanente do doente. A terapeutica fisiologica consiste no restabelecimento da respiração e na drenagem permanente das secreções; nos casos de obstrução prolongada, esse tratamento será mais efetivo se acompanhado da traqueotomia.

O [illegible] em tempo, da obstrução secretória pela traqueotomia, oferece novas [illegible] que seja evidenciado um prognóstico satisfatório para muitas doenças e lesões.

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The Prostatic Cavity After Surgical Intervention

An Anatomotopographic Study

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AND
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THE status of the prostatic bed and the type and degree of its involution are important in evaluation of functional results after a prostatic surgical procedure. The present methods of studying this area are unsatisfactory.

The pertinent information obtainable by postmortem investigation of patients who have had previous prostatectomies is limited in scope. It is difficult to reconstruct from single specimens the progressive anatomic changes that occur during involution.[1] Prostatectomies have been performed on cadavers and an attempt made to study the remaining cavities.[2] The topographic anatomy noted in these fixed specimens does not accurately depict the local changes that occur after prostatectomy in the living. The absence of vital tonicity effects the configuration of the cavity, and the true position, direction and relations of the structures at the operated site are distorted.

Postoperative urethrocystoscopic study is not as widely employed as it might be for this purpose. Patients resent further cystoscopic manipulation, and the urologist is hesitant about instrumentation because of the danger of initiating bleeding or activating infection. Even when a cystoscopic study is performed, it is inadequate in many respects. The field of the lens limits the examination to transitory views of many small anatomic areas, and accurate determination of the size of the cavity or the overall structure of the prostatic bed is difficult. Also, cystoscopic data are recorded by verbal description, and there is a great personal variation in perspective and completeness.

It is the purpose of this paper to present urethrocystographic investigation as a profitable procedure for determining the status of the prostatic bed. We propose to discuss the topographic anatomic picture observed on typical urethrograms at timed intervals after various prostatic operations.

Indications.—Urethrographic study is indicated after prostatectomy to survey the anatomic changes produced in the urethra by various types of operation, to visualize the mechanism and extent of involution of the prostatic bed and to ascertain the presence of postoperative pathologic conditions. This method presents a permanent graphic record for the appraisal of surgical technics, for the evaluation of follow-up treatment and for systematic study of the sequelae that occur after surgical complications. The simplicity of this procedure minimizes the danger of infection, trauma to the tissues and discomfort to the patient. In many instances, when cystoscopic study is unsatisfactory or impossible, urethrographic examination is the method of choice.

Technic.—Various opaque media, such as lipiodol, iodochloral, sodium iodide, skiodan, acacia and Rayopaque[3] have been used. We now employ a new substance, Medopaque U,* which is superior to the iodized oils for cystourethrographic use. This medium mixes with water and urine, flows easily, is well tolerated by the mucous membranes, and produces a homo-

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*Medopaque U was furnished by the Pell-Craig Company, N. Y.

cavity. The size, shape and contour of the prostatic cavity after uncomplicated prostatectomy are influenced by the following factors:

A. *The Bulk of the Gland and the Size of the Component Lobes.*—The amount of prostatic tissue removed by operation may be a few grams in the small fibrous prostate or 100 Gm. or more in the very large adenomatous type. The dimensions of the cavity will, therefore, vary accordingly. The rate of hypertrophy of the separate lobes often varies considerably, and the remaining cavity may be asymmetric. The large midlobe, especially of the pedunculated intravesical type, will hardly influence the size of the cavity unless there are also large lateral lobes.

B. *Types of Pathologic Prostatic Condition.*—*Carcinoma*: Carcinoma of the prostate can be definitely diagnosed by urethrographic study only when the urethral channel is invaded, and, since urethral involvement is a late manifestation, no reliance can be placed on negative signs. When neoplastic tissue grows into the canal, the prostatic portion of the urethra appears moth-eaten and the base of the bladder irregular. Inadvertently, an attempt is sometimes made to enucleate a carcinomatous prostate and, no definite line of cleavage being found, the gland is torn from its capsule. A grotesquely shaped cavity will usually be visualized on the postoperative urethrogram. Carcinoma of the bed of the prostate is apt to occur at any time after prostatectomy, and its irregular, asymmetric growth will also produce bizarre urethrograms.

2. *Fibrosis*: The atrophic prostate is a definite entity and gives rise to obstructive symptoms. The histologic changes consist of replacement of the glandular elements by connective tissue, which eventually contracts and constricts the encompassed urethra. On rectal examination the prostate is small, firm and regular in contour. The preoperative urethrographic signs are flattening of the base of the bladder, shortening and narrowing of the prostatic portion of the urethra, and absence of the verumontanum. The urethro-

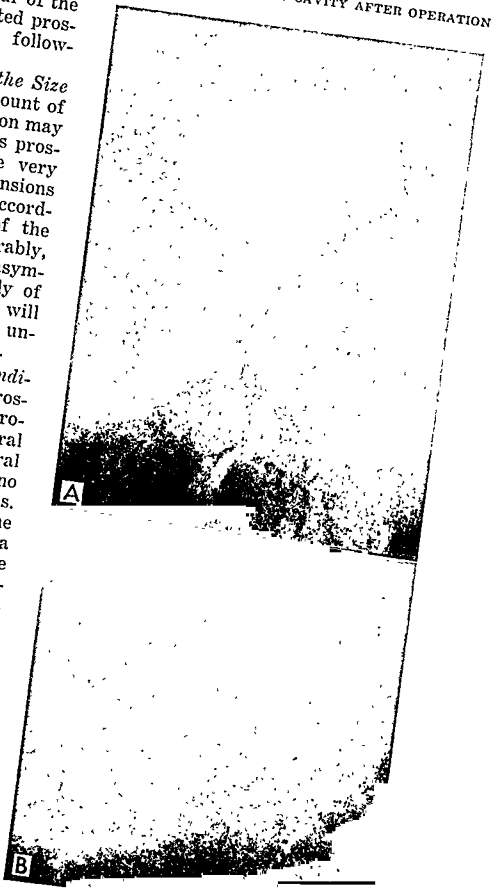


Fig. 1.—Films of patient who, one year after transurethral resection of a prostate with calcification, still complained of urinary incontinence. *A*, cystogram. Vesical neck is fixed and incompetent. Opaque medium leaks into noninvoluted prostatic cavity. *B*, voiding urethrogram. Note mottled calcification in residual prostatic tissue and rigidity of prostatic bed (see text under *Calcification*).

pansion. The anatomic structures adjacent to the anterior wall of the prostatic portion of the urethra limit radical changes in this direction. This type of gland actually undermines the trigone, and after removal the cavity has the appearance of a wide-mouthed urethral diverticulum.

c. *The "vesical prostate."* There are two pathways for enlargement of the prostate toward the bladder, and they depend on the relationship of the gland to the internal sphincter: if subsphincteric, it extends upward, elevates the base and neck of the bladder but remains extravesical; if transphincteric, it projects through the internal sphincter into the bladder cavity. The hypertrophy may be commissural, bilobular or trilobular; and since the degree of lobular enlargement is not always equal, many topographic variations of the posterior portion of the urethra are observed.

Vesical enlargement of the prostate effects the following anatomic alterations cystoscopically: The urethra is elongated and compressed. The base of the bladder is elevated and broadened, inclining the trigone so that the ureteral orifices are concealed from cystoscopic view. On cystoscopic examination of the trilobular type an adenoma can be seen projecting from the posterior wall of the prostatic portion of the urethra, forming lateral sulci which merge with the urethra to form a Y shape.

The roentgenographic appearance parallels the anatomotopographic picture. The urethrogram reveals a semicircular pressure defect at the lower central portion of the bladder and elongation of the prostatic portion of the urethra. The supracollicular portion undergoes changes in shape, form and direction, depending on whether the enlargement is commissural or lobular. On the oblique view the prostatic portion of the urethra may appear as a fan-shaped widening, owing to compression by the lateral lobes stretching the urethra in an anterior-posterior direction. With extension of the lobes through the sphincter, the widened portion is bifurcated and protrudes into the bladder. The urethra is usually in the midline but may deviate laterally, depending on the degree of asymmetric enlargement.

The appearance of the cavity after enucleation of a subsphincteric and a transphincteric type of gland varies. The cavity of the subsphincteric gland is separated from the bladder cavity by constric-

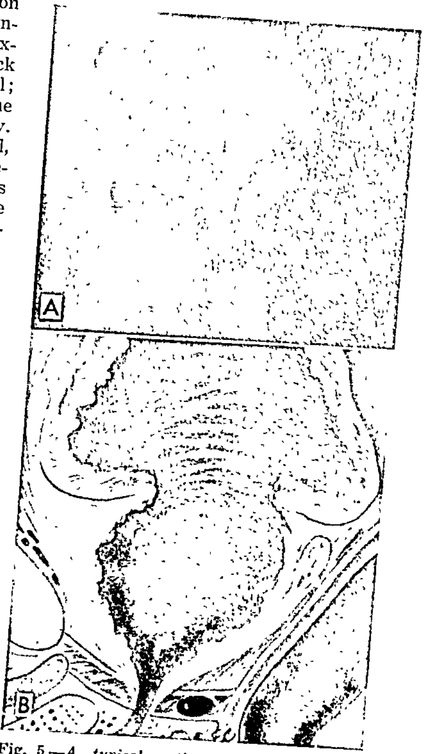
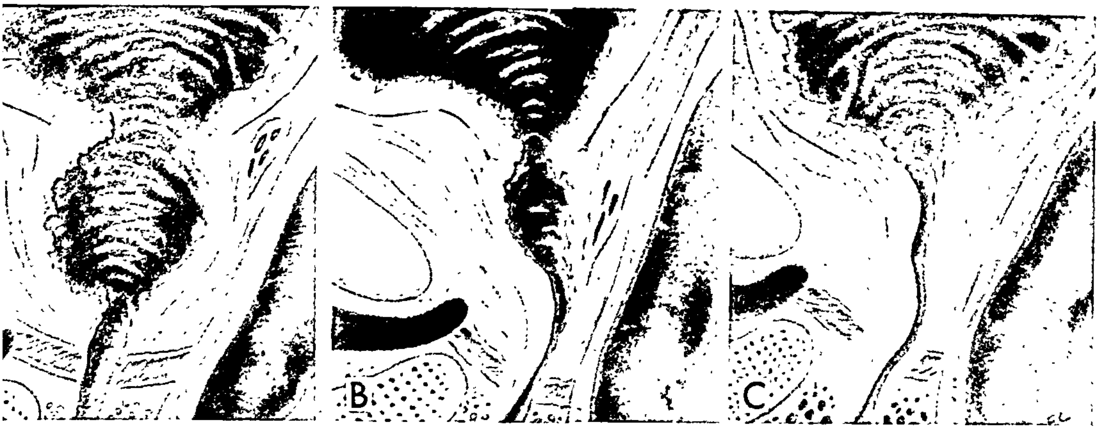


Fig. 5.—*A*, *typical* urethrogram obtained after suprapubic enucleation of an intravesical hypertrophied prostrate of transphincteric type. Note funnel appearance of prostatic cavity with bladder cavity, which appear almost as one. *B*, diagrammatic sketch, showing marked ato[illegible] of vesical neck.



—The three stages of involution of the prostatic urethra. *A*, contraction after surgical trauma; *B*, obliteration of cavity, and *C*, regeneration of urethral canal.

the hypertrophied vesical neck and he appearance of an hourglass (Fig.

cavity of the transphincteric gland inuous with the bladder cavity and les a diverticulum at the bladder he slight notching between the two s indicates the region of the dilated l sphincter (Fig. 5).

he combined type. Prostatic hyper- may occur in association with any ation of the aforedescribed types. travesical and intraurethral concur ommonly, but one or the other may ninate.

position, shape and contour of the ic cavity after enucleation of a com- type will depend on the degree of ype involved in the specific hyper- .

nvolution After Prostatectomy.—1. *rostatic Portion of the Urethra*: It unusual at the time of operation to e contraction of the prostatic cavity a few minutes after removal of the na. The degree of this contraction markedly, but it is not complete. entual involution of the prostatic can best be described in three stages 6).

tatus after surgical trauma. We aken urethrograms four days after rethral resection and eight days pen operation. The prostatic cavity iately after removal of the catheter appears as an irregular funnel-shaped widening, with the base at the bladder and the apex in the region of the verumontanum. If the vesical neck has been resected or injured at operation or has been dilated by the prostatic growth, the bladder and the prostatic cavities appear contiguous. Otherwise, the two cavities are separated by a notching or a cylindric band which varies in caliber and length and represents the canal through the so-called internal sphincter. The membranous portion of the urethra is wider and the prostatic cavity larger on voiding as compared with retrograde urethrogram. If a roentgenogram is taken at the termination of voiding, when the bladder is empty, a slight, irregular, luminal dilatation filled with the opaque medium persists in the supracollicular region. This is due to atonicity secondary to edema, adherent mucus, superficial slough and tabs of devitalized tissue.

b. *Obliteration of the prostatic cavity.* In about two weeks, when the edema subsides and the superficial necrotic tissues are eliminated, the wall becomes less ragged and the cavity narrows, especially in its center. A repeat urethrogram will show a smaller but still dilated prostatic cavity, a clearer outline of the external sphincter and increased tone of the entire urethral canal.

In a few weeks the prostatic cavity becomes involuted to a spindle shape with

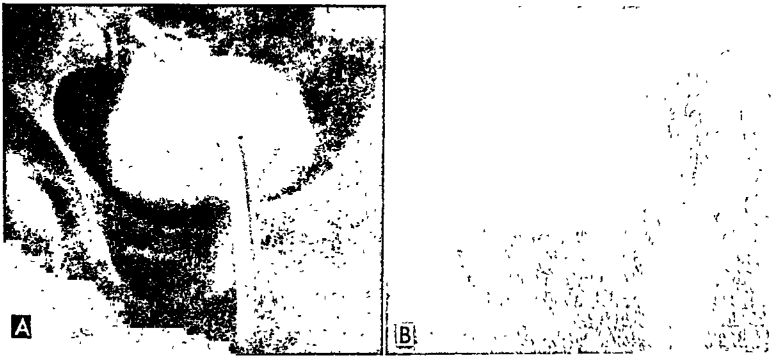


Fig. 7.—*A*, preoperative cystogram. Benign prostatic hypertrophy. *B*, cystogram [illegible] after the operation.

a slight dilatation in the middle third. At this stage the cavity is considerably diminished; the walls are less ragged; and the vesical neck lies at a slightly lower level.

c. *Regeneration of the urethra.* In two to four months the mucosa of the operative area has completely regrown, and the supracollicular portion of the urethra, which is now further narrowed and shortened, appears smooth. The sphincteric impressions are now well delineated.

At the end of a year the prostatic cavity has contracted in all directions almost to its normal size and shape, and sometimes the prostatic portion of the urethra regenerates so completely that it is difficult to realize from the urethrogram that a prostatectomy has been performed.

2. *The Bladder*: The involution of the bladder is slow and surprisingly complete in those cases in which a satisfactory prostatectomy has been performed (Fig. 7). Removal of the obstruction causes the in-

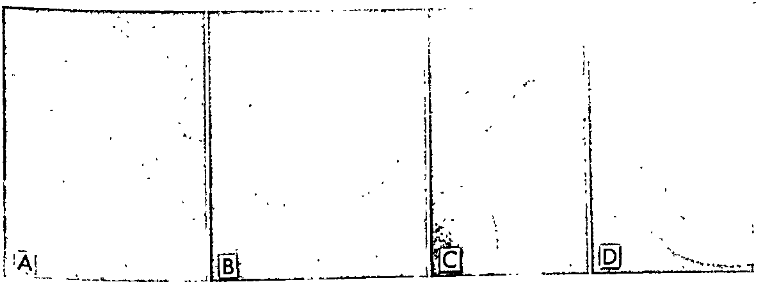


Fig. 8.—Noninvoluted vesical neck. Patient complained of terminal dribbling after a secondary delayed hemorrhage which required packing. *A*, preoperative cystogram of combined type of prostatic adenoma. *B*, postoperative cystogram taken one year later. Note opaque medium in prostatic cavity resulting from inadequacy of internal sphincter. *C*, urethrogram, anterior-posterior view. Funnel-shaped prostatic cavity contiguous to bladder. *D*, urethrogram, oblique view. Note failure of vesical neck to involute.

travesical pressure to return to normal, and as a result the bladder wall thins out; saccules and trabeculations tend to disappear; the capacity of the bladder increases, and its contour becomes rounded and smooth. The concave filling defect at the base of the bladder observed on the preoperative cystograms of patients with large adenomatous glands becomes convex and descends to 1 or 2 cm. below the level of the upper border of the bodies of the pubic bones. Failure to remove all obstructions completely, excessive scarification, and stricture formation are the chief causes of a persistent prostatic type of bladder hypertrophy.

3. *The Anterior Portion of the Urethra*: The presence of severe anterior urethritis during convalescence and its persistence after prostatic surgical intervention may lead to narrowing of the anterior urethra.[9] The mucosa becomes edematous, and inflammatory exudates form in the submucosal tissues which become organized and eventually are replaced by varying amounts of scar tissue. The urethral canal loses its distensibility according to the degree of sclerotic infiltration.[10] On the urethrogram, a wavy outline and a diminution of the size of the lumen are noted. In those patients in whom the process is severe and prolonged, the sclerosis results in stricture formations.

The configuration of the prostatic cavity is also influenced by the method of prostatectomy, the technic, and the type of hemostasis (Fig. 8). We have avoided discussing these surgical factors, since we hope to present them at a later date in greater detail.

SUMMARY

1. Urethrocystographic study is a valuable procedure for study of the prostatic cavity.
2. The local anatomic alterations produced by prostatectomy, the involution of the prostatic cavity, and the regeneration of the urethral canal can be visualized by periodic urethrographic studies.
3. Urethrocystographic investigation will help differentiate the normal topographic anatomy of the prostatic cavity from structural deformities which are often etiologic factors in the production of persistent symptoms.

RESUMEN

1. La uretrocistografía es un procedimiento de valor para el estudio de la cavidad prostática.
2. Pueden ser visualizadas por estudios uretrográficos periódicos, las alteraciones anatómicas locales producidas por prostatectomía, la involución de la cavidad prostática y la regeneración del canal uretral.
3. La investigación uretrocistográfica ayudará a diferenciar la anatomía topográfica normal de la cavidad prostática de las deformidades que son frecuentemente factores etiológicos en la producción de síntomas persistentes.

ZUSAMMENFASSUNG

1. Die Roentgenuntersuchung der Harnroehre und der Harnblase ist ein wertvolles Verfahren zur Untersuchung des Prostatabettes.
2. Die oertlichen durch Prostataresektion verursachten anatomischen Veraenderungen, die Rueckbildung des Prostatabettes und die Wiederherstellung der Harnroehre koennen durch periodische urethrographische Untersuchungen sichtbar gemacht werden.
3. Die urethrozystographische Untersuchung erleichtert die Unterscheidung normaler topographisch-anatomischer Verhaeltnisse des Prostatabettes von strukturellen Entstellungen, die haeufig die ursaechlichen Faktoren fur Entstehung anhaltender Symptome bilden.

RIASSUNTO

1. La uretrocistografia è un metodo utile per lo studio della cavità prostatica.
2. Le alterazioni anatomiche locali prodotte dalla prostatectomia, l'involuzione della cavità prostatica e la rigenerazione

del canale uretrale possono essere studiate mediante periodici esami uretrografici.

3. Le ricerche uretrocistografiche possono aiutare a differenziare la normale anatomia topografica della cavità prostatica dalle deformità strutturali che sono spesso la causa di disturbi persistenti.

SUMÁRIO

1. A uretografia é um valioso processo para estudo da loja prostatica.

2. As alterações anatomicas ocasionadas pepla prostatectomia, a involução da loja prostatica e a regeneração do canal uretral podem ser bem visualizados por estudos uretrograficos periodicos.

3. A investigacão uretro-cistografica auxiliará bastante na diferenciação entre a anatomia topografica normal da região e as deformidades estruturais que são considerados fatôres etiologicos na producão de sintômas persistentes.

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To Our Contributors Abroad

We regret to announce that under current publishing conditions it has become impossible for the *Journal* to arrange the translation into English of original articles submitted in other languages. With the single exception of articles written specifically for the *Seccion en Espanol*, which, of course do not require translation, we must therefore request that all articles henceforth be submitted in the English language. Prompt publication can be greatly facilitated if all manuscripts are typed in double or triple space to allow room for editorial corrections. Your cooperation will be deeply appreciated.

The Vaginal Approach to Pelvic Surgical Procedures

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THE vaginal approach to pelvic surgical procedures is not a new or experimental method. It has been proved that this approach was attempted by the earliest surgeons. Among the early Greek and Roman medical writings there are references to removal of the uterus through the vagina, and surgeons of Alexandria are supposed to have performed the operation many years before Christ. The first case was reported, however, by Berengira of Bologna in 1507, and the first authentic vaginal hysterectomy in America was reported in 1877 by Warren, who was professor of anatomy and surgery at Harvard. In the same year Noegerath of New York performed, described and published the technic of the first definitely planned vaginal hysterectomy. This naturally evoked in surgeons a great interest in the operation, since it offered the possibility of much less mortality and morbidity than did the abdominal approach. It was logical, therefore, for the early gynecologists to adopt and, in time, improve the vaginal approach to surgical treatment of pelvic pathologic conditions. As a result, great American and European schools of vaginal surgeons came into being.

However, when at the end of the last century aseptic surgical technics were perfected and the abdomen was being opened with comparative safety, gynecologists largely deserted the vaginal approach to pelvic disease except for plastic procedures. In most clinics vaginal hysterectomy was abandoned entirely; consequently a new generation of surgeons grew up totally unacquainted with the technic of this operation.

Fortunately, nevertheless, a few clinics here and abroad kept the technic alive. When it was definitely proved that supravaginal hysterectomy was inadequate (because the remaining cervix underwent malignant changes in some cases and the remaining infected cervical stump was the cause of low-grade pelvic infection, cystitis, thrombophlebitis, chronic leukorrhea and postoperative invalidism), the complete hysterectomy was again advocated as prophylaxis in these complications. It was then that the vaginal surgeon had the right answer, because vaginal hysterectomy is a complete hysterectomy with low mortality and morbidity rates. Consequently, a great impetus was given to the vaginal approach.

To meet this challenge, abdominal surgeons were compelled to improve the technic of complete abdominal hysterectomy. With the added help of blood transfusion, antibiotics, sulfonamides and improved anesthesia, they reduced the mortality and morbidity rates. While these were no higher, and in some hands were lower, than those associated with incomplete or supravaginal hysterectomy, they were still higher than those involved in the vaginal approach.

The ever-increasing and voluminous literature that has accumulated on vaginal hysterectomy proves this low level of mortality and morbidity. Babcock reported a series of 300 cases and Danfort a series of 266 cases, both without mortality.[1] Kennedy performed 2,000 vaginal hysterectomies (clamp method) with a mortality rate of 0.02 per cent, and Heaney did 1,056 with a mortality rate of 0.025 per cent,[2] which was also the mortality rate

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encountered in my own series of 2,427 vaginal hysterectomies reported in 1944.[3] Smith[4] recently reported 844 hysterectomies with 1 death; Weaver,[5] 884 hysterectomies with 1 death, and Brill,[6] 1,121 hysterectomies with 3 deaths.

Danfort's morbidity rate of 9.02 per cent in 266 cases, based on the standards of the American College of Surgeons, is truly a remarkable record and is in keeping with the experience of most vaginal surgeons.

Here, therefore, is the record of approximately 7,500 vaginal hysterectomies, performed for a variety of indications by 8 scattered operating surgeons using different technics, with a maximum mortality of one-fourth of 1 per cent. I doubt that there is another major operative procedure that offers as great a margin of safety.

At the Ninth Assembly of the International College of Surgeons I reported 2,427 vaginal hysterectomies with 6 deaths. At this time I wish to report 860 cases without a single death.

TABLE 1.—*Age Distribution*

Patients between ages of 27 and 35 years	44
Patients between ages of 36 and 45 years	318
Patients between ages of 46 and 55 years	404
Patients between ages of 56 and 65 years	72
Patients between ages of 66 and 75 years	18
Patients between ages of 76 and 86 years	4

TABLE 2.—*Indications*

Indications	*Number*
Fibromyoma of uterus, uncomplicated	538
Fibromyoma of uterus fixed to anterior abdominal wall by previous operation	4
Fibromyoma of uterus and bilateral chocolate cysts of ovaries	3
Fibromyoma of uterus and ovarian tumors	25
Fibromyoma of uterus and chronic bilateral tubo-ovarian disease	15
Hyperplastic or fibrotic uterus with excessive bleeding, in or about menopause	90
Prolapse of uterus	140
Prolapse of uterus with carcinoma of cervix	2
Prolapse of uterus following interposition operation	1
Badly lacerated diseased cervix in or about menopause	20
Adenomyoma of uterus	18
Prolapse of uterus with carcinoma of body of uterus	2
Leiomyosarcoma of uterus	2
Total	860

TABLE 3.—*Additional Operations*

Additional Procedures	*Number*
Removal of one or both tubes	153
Removal of one or both ovaries	226
Plastic operation on urethra for incontinence	80
Anterior colporrhaphy	160
Posterior colpoperineorrhaphy	406
Repair of complete perineal tear	3
Preliminary episiotomy	26
Removal of Bartholin cyst	4
Repair of inguinal hernia	5
Repair of umbilical hernia	3
Appendectomy	6

Note that in this series there we
carcinomas of the cervix, 2 carcinoma
the fundus and 2 sarcomas. They w
diagnosed on histologic study. The c
cinoma of the cervix was diagnosed
carcinoma *in situ*. We do not recomme
vaginal operation for carcinoma either
the cervix or of the fundus. It has be
proved that radium still gives the be
results for carcinoma of the cervix, a
for fundal carcinoma we use implantatio
of radium and a complete abdomin
hysterectomy six to eight weeks late
which is the standard method in all goo
clinics.

With this evidence of low mortality and morbidity rates, I always elect to do a vaginal hysterectomy, within its limitations, whenever a hysterectomy is indicated. The favorable mortality and morbidity rates widen the scope of the operation so that I operate for conditions that would not justify operation by the abdominal approach. In addition to the safety of the procedure, there are other factors that make the operation the more desirable method of approach. The absence of an abdominal incision, with the resultant scar, is a great advantage, not only from the cosmetic viewpoint; in a broader sense this is of paramount importance. Incisional hernias do not occur, and such complications as adhesions of omentum and intestines to the scar and separation or infection of the incision are eliminated. Because of fewer immediate and late complications, convalescence is smooth and the return to health is rapid. The absence of an incision makes limita-

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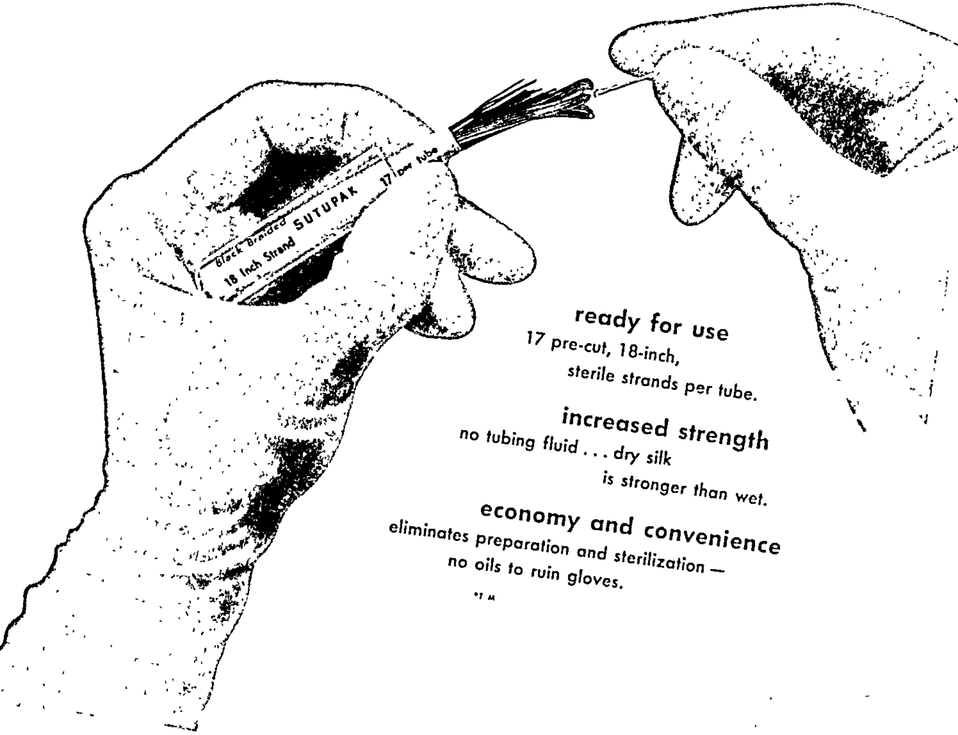

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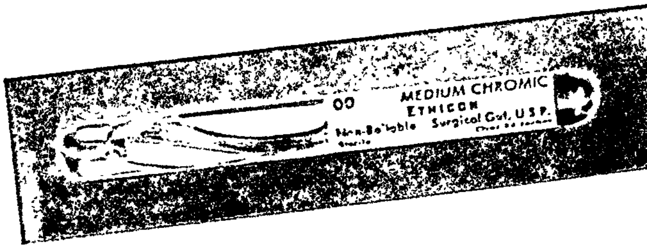

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Official monthly publication of the International College of Surgeons

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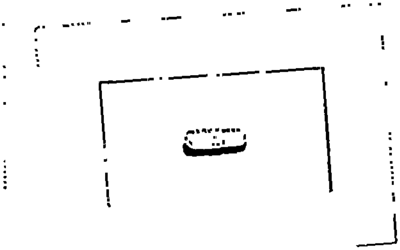

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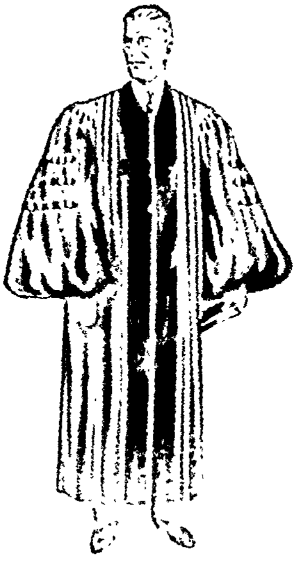

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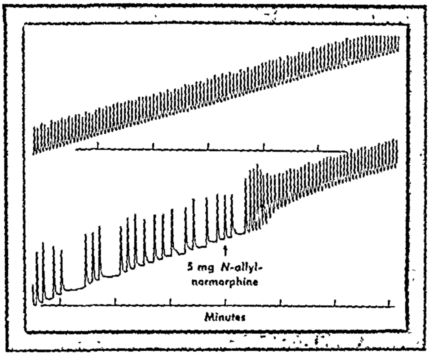

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Literature available

[1] Eckenhoff, J. E., Elder, J. D., and King, B. D., *Am J Med Sci* 223:191, February 1952 [2] Eckenhoff, J. E., Hoffman, G. L., and Dripps, R. D., Annual Meeting of the American Society of Anesthesiologists, Washington, D. C., Nov. 8, 1951

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Northeastern Regional Meeting in Philadelphia

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Registration 8:00 A.M.

Friday and Saturday, February 13-14, 1953

Bellevue Stratford Hotel, Philadelphia, Pennsylvania

Scientific Program each morning preceded by motion pictures, 9:00-9:20 A.M.

Friday, 9:20 to 12:00 noon

Paper to be presented:

1. Medical and Surgical Management of Occlusive Arterial Lesions.
2. ACTH and Cortisone in Relation to Surgery.
3. Modern Drug Therapy and Its Relation to Surgery of Tuberculosis.
4. Silent Lesions of the Abdomen.
5. The Use of Proteolytic Enzymes in War Wounds.

Luncheon, Friday and Saturday, 12:00 Noon Followed by Panel Discussions.

Guest Speakers—Hon. Joseph S. Clark, Jr., Mayor of Philadelphia, and Horace Stern, Chief Justice, Supreme Court of Penna.

Friday, 2:00 P.M. to 5:00 P.M. — Panel:

1. Hypersplenism.
2. Some Research and Studies in Pancreatic Disease.
3. Treatment of Atresia of the Esophagus by the Trans-thoracic Approach.
4. Trans-lumbar Arteriography.

Friday, 7:00 P.M.—Banquet

Guest Speaker Joseph S. Lawrence, M.D. Director, Washington Office, A.M.A.

Saturday, 9:20 A.M.—Panel:

1. Thoracic Surgery.
2. Safeguards in Gallbladder Surgery.
3. Operative Cholangiography.
4. Intrathoracic Goiter.

Saturday, 2:00 P.M. to 5:00 P.M.—Panel:

1. Lesions of the Colon.
2. Anesthesiology.

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1 Ansbro, F. P., and others: Anesthesiology 13 306, 1952 2. Jason, A [illegible] Pain Control, presented before the Section on Anesthesiology of the American Medical Assc [illegible] 3. Deaton, W. R., Jr., and Bradshaw, H H Am Surgeon 18 616, 1952 4 Puderbach, W J., [illegible] 952. 5. Tucker, C. C.: J Kansas M. Soc 53.230, 1952. 6 Gross, J M., and others: New York [illegible] 7 Penn, S. E.: Arch Otolaryng 56 59. 1952 8 Cappe, B E., and Pallin, I M: Am Pract [illegible]

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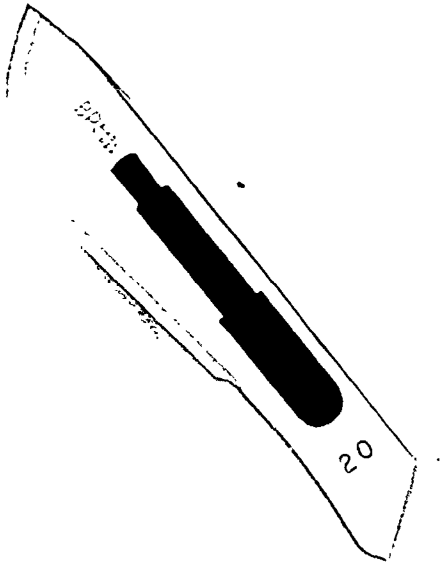

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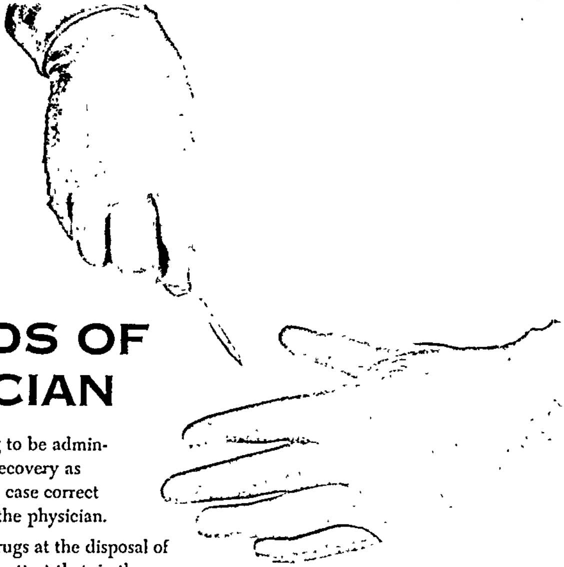

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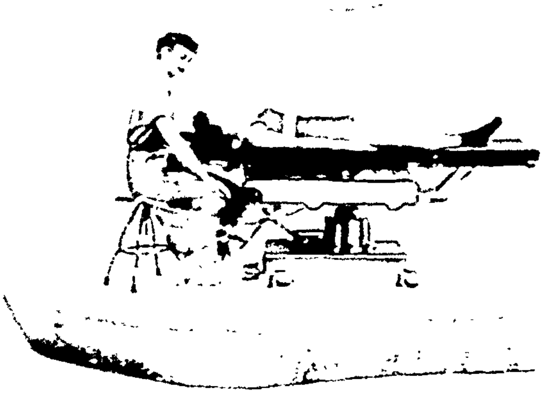

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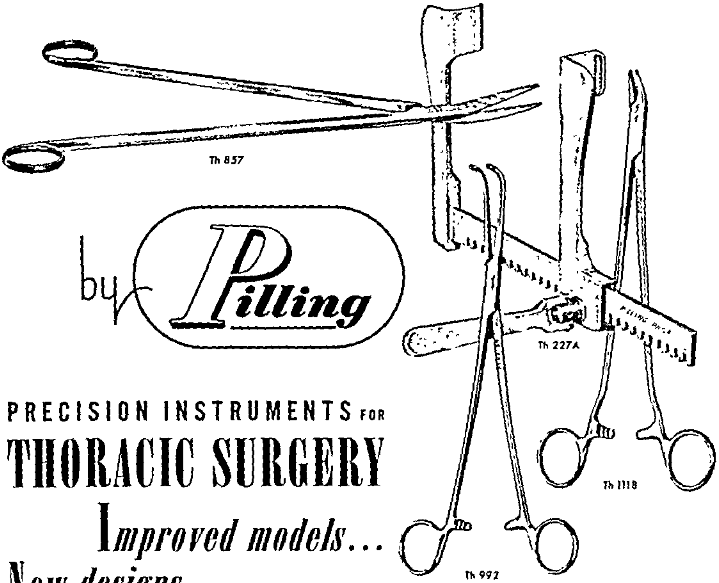

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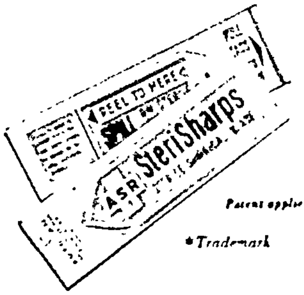

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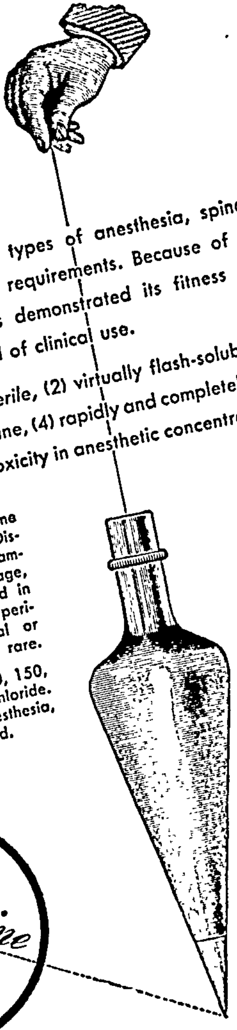

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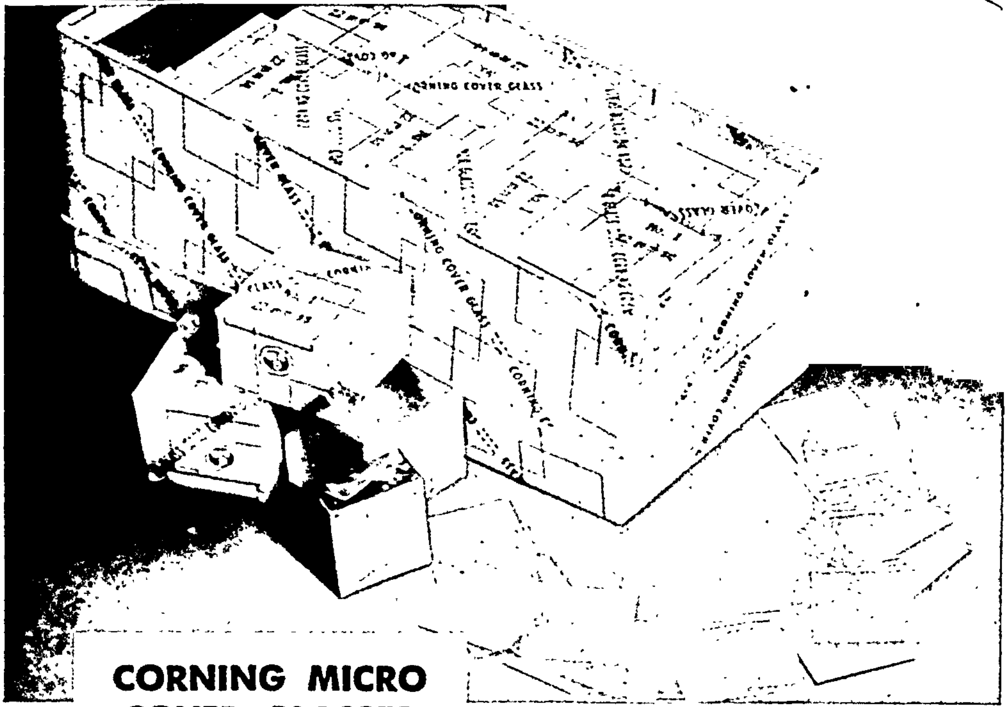

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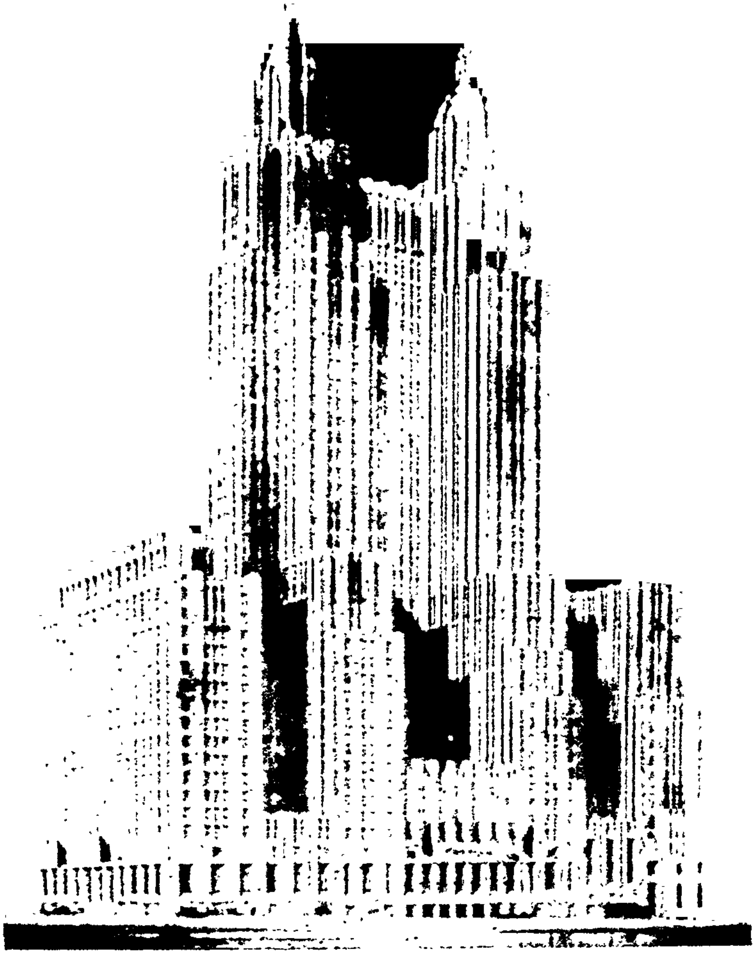

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Dream and Fulfilment

The Surgeons' Hall of Fame of the International College of Surgeons

Dr. Max Thorek, Founder

ALMOST coincidentally with the founding of the International College of Surgeons, a coexistent dream awoke in my mind—the vision of some bright day, perhaps not too far in the future, when men of genius of our profession all over the world, in all ages of recorded history, should receive due recognition and perpetuation of their great achievements; of a place where, in dignity, beauty and peace, their lives and their works should be enshrined forever. For if "the laborer is worthy of his hire," is not the conqueror of pain, disease, ignorance and superstition worthy of much more? Has he not earned immortality even on earth?

My vision set this shrine in America, symbol of freedom; but I saw therein men from every nation on earth—men who, consciously or unconsciously, realized and acted upon the great truth upon which our College is founded: that science has no fatherland but the world. The newborn International College of Surgeons was obviously and happily the appropriate group

INTERNATIONAL SURGEONS HALL OF FAME CHICAGO
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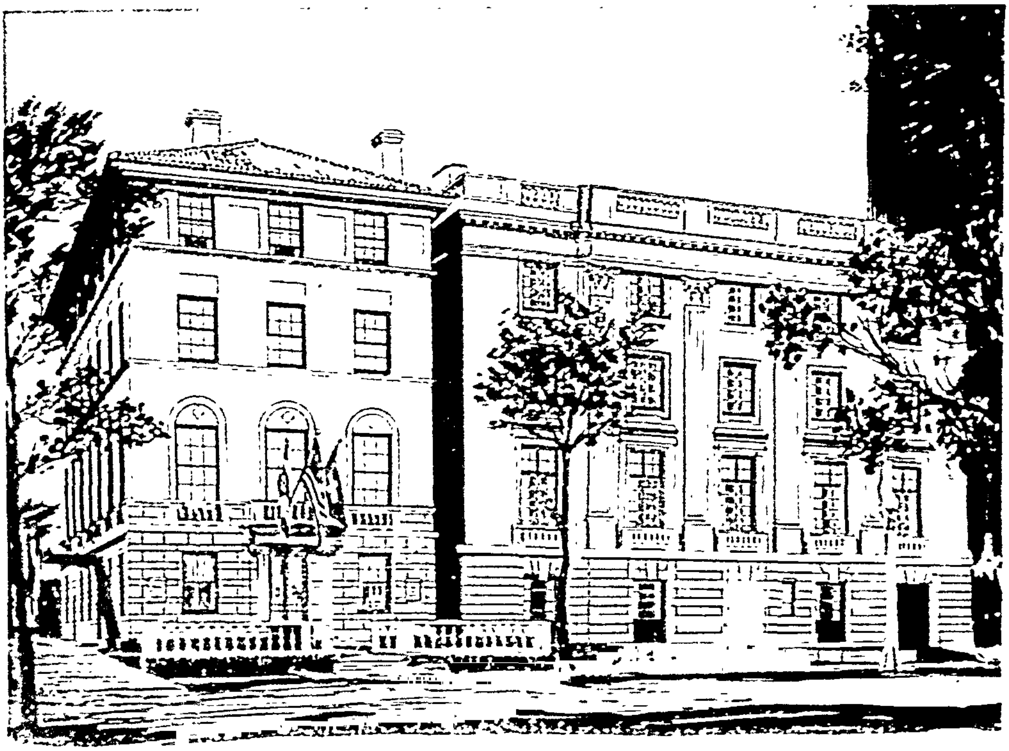
Architect's sketch of the arcade in the Surgeons' Hall of Fame, showing niches for memorials famous surgeons of all nations and from the beginning of surgical history. The Hall of Fame will housed in the Home of the International College of Surgeons in Chicago. [illegible] presented in the February issue of the Journal.



Architect's drawing of the Home of the International College of Surgeons on Chicago's Lake Shore Drive. The Home is here shown as it will appear after integration of the present headquarters at 1516 (left) with the adjoining building at 1524-26 (right). The second building is a recent purchase of the College to meet the expanding needs of the organization.

to create such a shrine—a Hall of Fame for surgeons, excluding none whose achievements bespeak his entrance, regardless of creed, color, epoch or national origin.

This dream, once manifested, was always with me. It had to be put aside for a time while we dealt with the exigencies of building a new organization planned on so broad a base; it had to wait until the International College might justly lay claim to its sponsorship, and until a fitting place and time had been determined. For several years now we have had the beautiful College Home in Chicago, but even this, with the routine headquarters activities abuzz within it, did not seem entirely meet for our Hall of Fame. With the purchase, not long ago, of another majestic old mansion adjoining the first, the realization of my dream became possible. The College meanwhile, having been blessed with the ever-growing strength and achievement its high principles and consistent practice deserve, had more than readied itself to discharge the trust. The long wait is over; the felicitous time has come; the International Surgeons' Hall of Fame is an accomplished fact. At a recent meeting of the Board I projected the plan, which was met with unanimous acclaim.

We talked it over, noting that neither in the Hall of Fame in Washington, which is confined to statesmen, nor in the more inclusive Hall of Fame at New York University, have the great surgeons of the world been given their due. A recent editorial in *Science*, written by the curator of the Hall of Fame in New York, points out this inequity succinctly. "Certainly a scientist like Gibbs," says this writer, "or a physician like Beaumont or MacDowell, has made his record, and is it not logical to expect . . . some scientific body to herald the achievements of those within its own ranks?"

Most certainly it is, and surely no scientific body is so well equipped for the task as the International College of Surgeons, which from its very inception has taken the whole field of surgery, as wide as the world and as long as history, for its intellectual homeland. The final logic of the enterprise from our point of view lies in the fact that there is nothing in our Charter, our Constitution or our By-Laws that would confine access to surgeons of any one country. We see in the Hall of Fame another signal opportunity to foster international friendship with surgeons and through them with the peoples they serve, wherever they are.

Accordingly, plans for the Hall are moving apace. Architects are already at work; blueprints have been drawn, a preliminary slate of officers appointed. An Electoral College of approximately 150 members is being arranged, with medical historians representing all Sections of the College both here and abroad. Nominations, however, will not be confined to member nations; in the spirit of unlimited exchange of ideas that has always animated the College, names will be accepted from any surgeon on earth, and the Electoral Senate will deal impartially and judiciously with all. A decisive vote of the College will admit the nominee to perpetual abode in the Hall of Fame. Since time alone can bear witness to lasting worth, only the names of surgeons whose achievements have outlived them for a period of years will be eligible.

Designs for suitable memorials of the great men elected are already in the making, and the architectural details of the international shrine will shortly be made public. The Hall of Fame, together with the lectures on surgical history that will be given in the spacious amphitheatre to be constructed in the new section of the Home, will perpetuate through generation after generation of our posterity the fair fame of the great apostles of surgery from time immemorial and from every corner of the civilized world.

A long and brilliant list is ready to hand—the scroll of names that have come to us out of the past, from Hippocrates' time and before it; the names of men who ed across the world like meteors, w the dark corners of

There will be names, too, of later eras than these—names still, through desperate centuries, stained again and again with the blood of persecution. There will be names still newer—names of men who, freed at last from the shackles imposed by superstitious fear, have pioneered farther and farther toward the truth.

We shall honor these men, but not so much as they will honor us. As Agesilaus truly remarked, "It is not the places that grace men, but men the places." We are but paying another instalment of our agelong debt to those who cleared the way for us, a debt to which we can never write "paid in full." Without the heritage of knowledge and skill bequeathed us by the genius of the past, the genius of the future would be but a flickering torch.

We make this tribute, therefore, in gratitude and all humility, with the hope and prayer that the God of all knowledge and truth, the Compassionator of all human agony and the Source of that spark of creative power in man which has kindled every consoling fire men know, will grant His blessing in perpetuity to the International Surgeons' Hall of Fame, making it in truth and earnest an inspiration to all who enters its doors.

Committee on Arrangements
for the
International Surgeons' Hall of Fame

Plans and arrangements for the Surgeons' Hall of Fame are actively in progress. The Committee is as follows:

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The rules and regulations adopted, as well as the criteria for admission and the details of procedure and protocol, will be announced in the near future.

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Vol. XIX JANUARY, 1953 No. 1

Original Articles

Plastic Reconstruction of the Hip with Nylon*

RENÉ CHARRY, M.D., F.I.C.S.
TOULOUSE, FRANCE

THE surgeon's task, especially the orthopedist's, is not only to perform a blameless operation with an unfailing hand; it is more than that. It is to consider a suffering being, apprehend his pain at its deepest and, being better instructed than the patient about his overwhelming misery, afford him the human satisfaction he is entitled to for the present and the future. This requires due reflection and resolute action.

Easy solutions to the problem should be rejected; they may seem promising, but their use may prove mutilating. Throughout this study, therefore, I shall emphasize physiologic reconstruction as against articular prosthetic reconstruction.

Articular Plastic Reconstruction with Nylon.—Articular nylon plastic reconstruction aims at insuring the mobility of the reconstructed joint by means of a nylon film placed between the articular surfaces. The nylon film is a transparent plate 8 by 5 by 11 cm., Type 6, 0.05 cm. thick (Fig. 1).

My procedure necessarily implies the preservation and use of the osseous body of the femoral head. It may succeed in the treatment of various coxopathic conditions, but for one of them it is particularly well fitted: secondary coxarthrosis, which spreads in a hip with an inveterate subdislocation, the purely mechanical nature of which gives full value to the surgeon's action.

Nylon arthroplasty also makes mandatory—even when the use of this material is recommended—early surgical interv tion.

---

*The author is indebted to Dr Short of Boston and Prof Wilson of New York for the idea of using nylon in articular surgery

Read at the Eighth International Congress of the International College of Surgeons, Madrid, Spain, May 1952.

Former chief of the Clinique de Chirurgie Orthopedique a la Faculte.

Submitted for publication Aug 5, 1952

In collaboration with Prof. S. de Seze I have shown, in a motion picture presented at the Seventh Congress of Articular Diseases, New York, 1949, by accurate anatomopathologic sections, that the periarticular alterations associated with secondary coxarthrosis occur early and that the result of plastic repair is all the better

Fig. 1.—Flexible nylon plate, 0.5 cm. thick. This plate can be modeled.

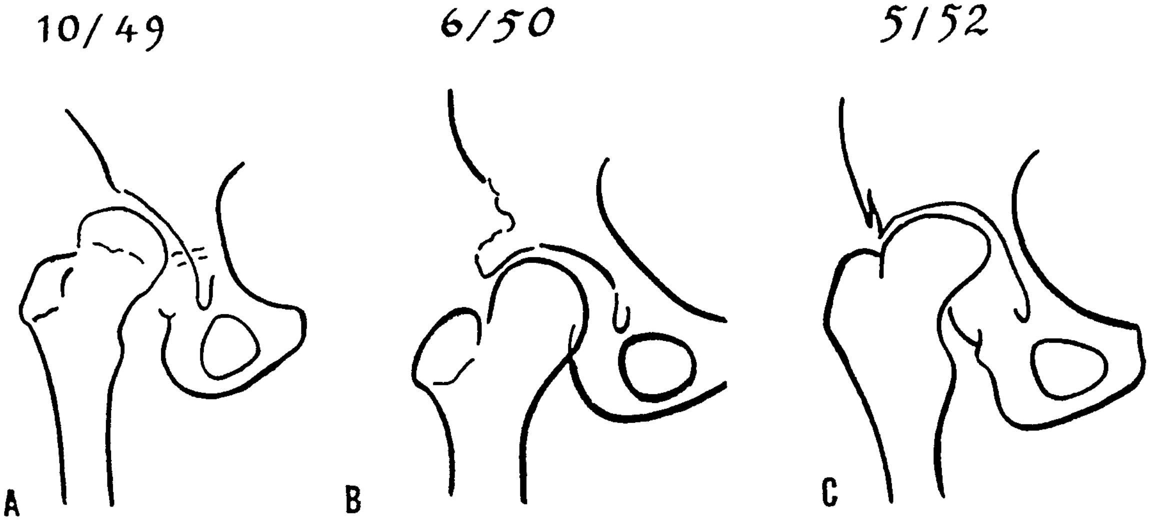

Chart 1 (Case 1).—Roentgen tracings of M., aged 14, with inveterate congenital subluxation. *A*, forepart, front view; *B*, intermediary tracing; *C*, postoperative tracing, front view. Spot due to hypertrophy of quadriceps muscle caused by operative pinching, an infrequent incident that imposes strict caution on the surgeon. Result excellent as to mobility.

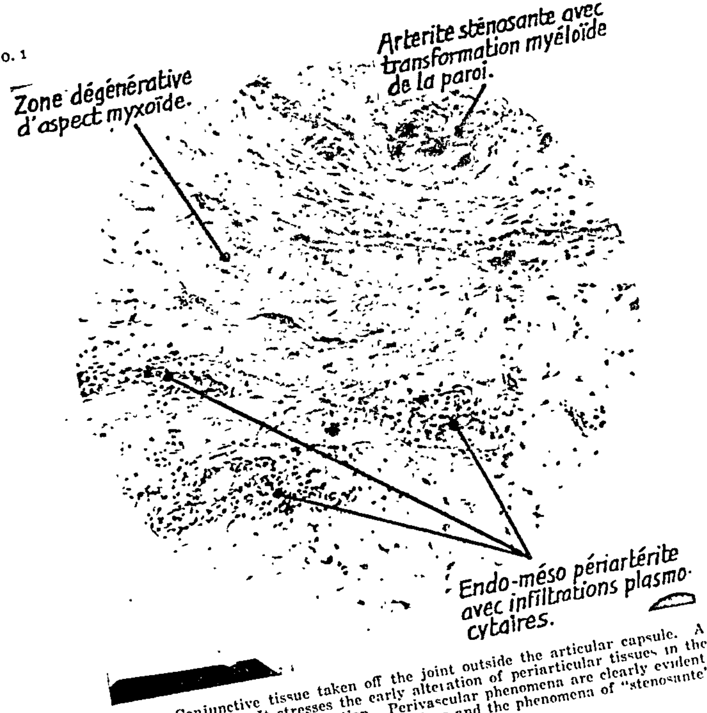
Arterite sténosante avec transformation myéloïde de la paroi.
Zone dégénérative d'aspect myxoïde.
Endo-méso périartérite avec infiltrations plasmocytaires.

Fig. 2—Conjunctive tissue taken off the joint outside the articular capsule. A fragment section. It stresses the early alteration of periarticular tissues in the presence of congenital subluxation. Perivascular phenomena are clearly evident, together with lymphoplasmocytic infiltrations and the phenomena of "stenosante" periarteritis.

if the operation can be performed on a joint surrounded by sound, pliant periarticular tissues.

Therefore, plastic reconstruction with nylon implies three considerations: (1) the minuteness of the operative procedure, (2) the mechanical nature of coxarthrosis, and (3) the desirability of early intervention.

Nylon is not limited to this use, however. It may also be employed as a means of reconstruction in surgical re-education (see table, Case 7) inveterate congenital subdislocation in adolescents (Case 1) vascular coxarthrosis not evolutive, even in the case of geodes (Case 2), and in certain types of inflammation, with caution. Its results, which may be less impressive in the last-mentioned instance, are still under careful study; however, I have certainly obtained a very fine result (Case 6).

Roentgen Appearance.—In contrast to secondary arthrosis (Fig. 3 *A*), nylon plastic repair of a joint on roentgen study (Fig. 3 *B*) shows a return to the normal shape, or almost so, a hip with its diaphysis, neck and head, and a deep acetabulum (Fig. 7), a structure gradually limited by

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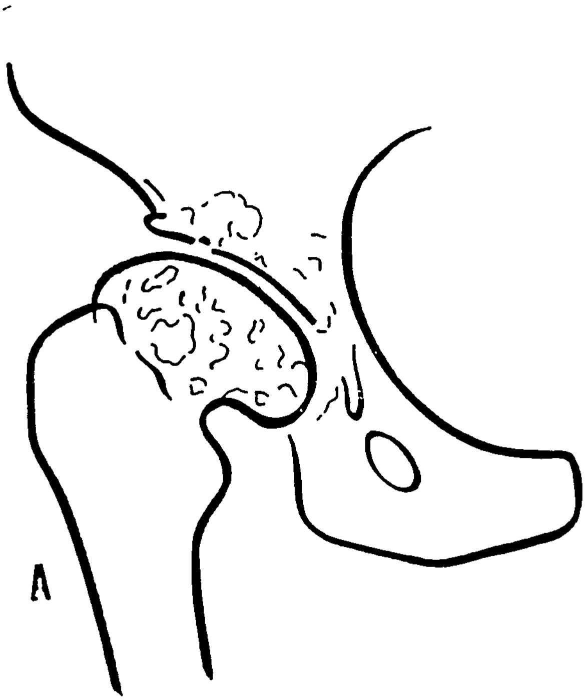

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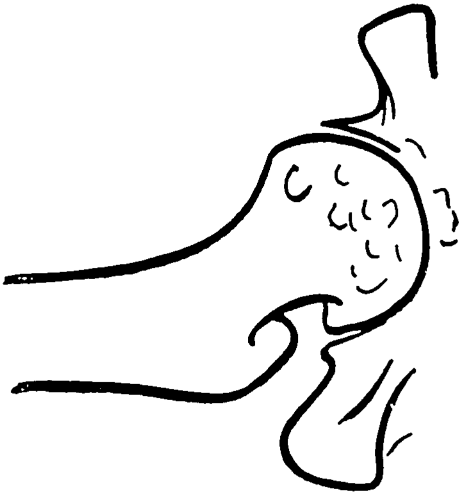

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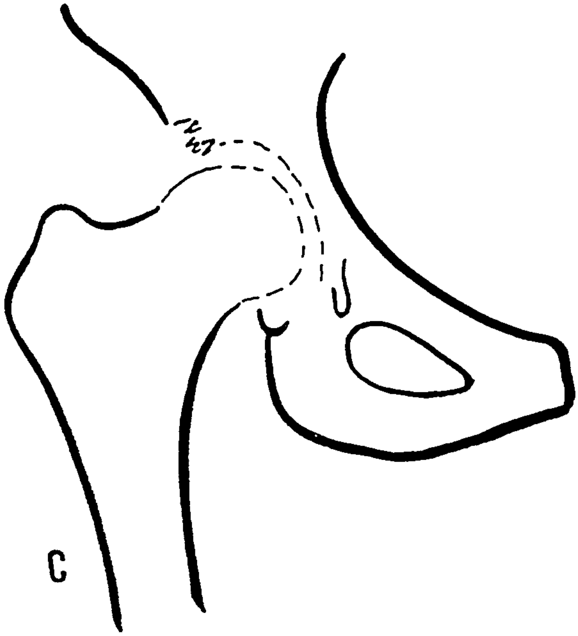

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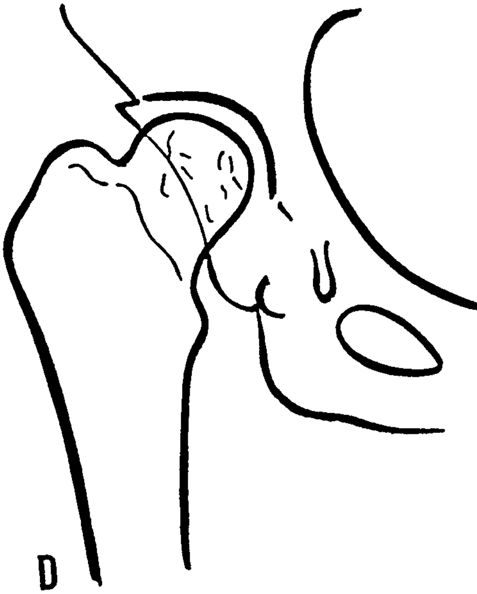

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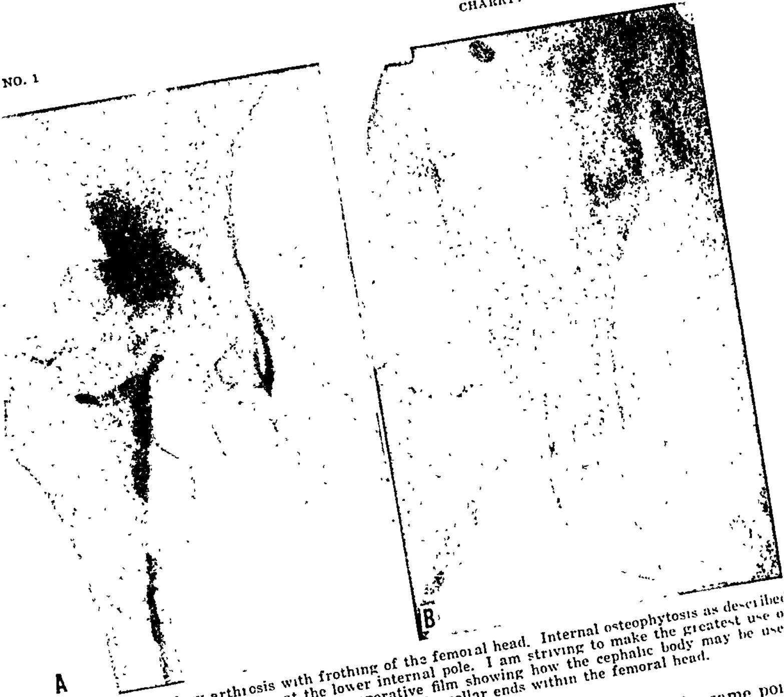

Fig. 3.—*A*, secondary arthrosis with frothing of the femoral head. Internal osteophytosis as described by Rutishauseer is clearly seen at the lower internal pole. I am striving to make the greatest use of this portion in remodeling t ehhead. *B*, operative film showing how the cephalic body may be used —under the diaphysis blade by which the collar ends within the femoral head.

a cortex (Fig. 4). Morphologic reconstruction depends upon preservation of the osseous body. Here I must stress an idea for which I am indebted to Prof. Rutishauser and his disciple Grasset: While the repairs are being made, changing the upper end of the femur into a modified, distorted, repaired hip, some new sound bone, apt to change into useful bone, appears; it forms always at the same poin
on the inner fore side of the femoral heac
it is the *internal osteophytosis* (Figs.
and 3 *A*). This internal osteophyto
should be used to the best effect, for
is essential to the structural renovatior
the hip thus carved (Fig. 3 *B*).

The opposite pole is the seat of deg
rate and necrobiotic lesions, geodes,

Chart 2 (Case 2, opposite).—Roentgen tracings of Mrs. P., aged 50; secondary arthrosis with
lar disturbances. *A*, forepart, front view; *B*, forepart, profile; *C*, intermediary tracing; *D*,
erative tracing, front view. Good result achieved only after strict reeducation through neurot
obturative nerve. Result would be far better if patient submitted to "osteotomy of derotati
shown by abnormal twisting of the upper end of the former femur. Patient is much pleased
tion is focused upon the geodes and vascular troubles, despite which a good result was achieve
very important, however, to operate before this stage has arrived. For secondary arthrosis,
tion must be early.

farcts and surface erosion, with pathologic alteration of tissues. Therefore, a fundamental conclusion appears: there are, in the femoral head, zones of pathologic tissue and zones of sound tissue. The surgeon must know how to use the better tissue for the reconstruction.

As for the functional recovery of periarticular tissues, the earlier the intervention, the more complete the recovery will be. Clinical study reveals a surprising mobility from the very first days, and soon a flexibility that is almost complete (Fig. 9).

No bad consequences have been encountered. One point may be mentioned,

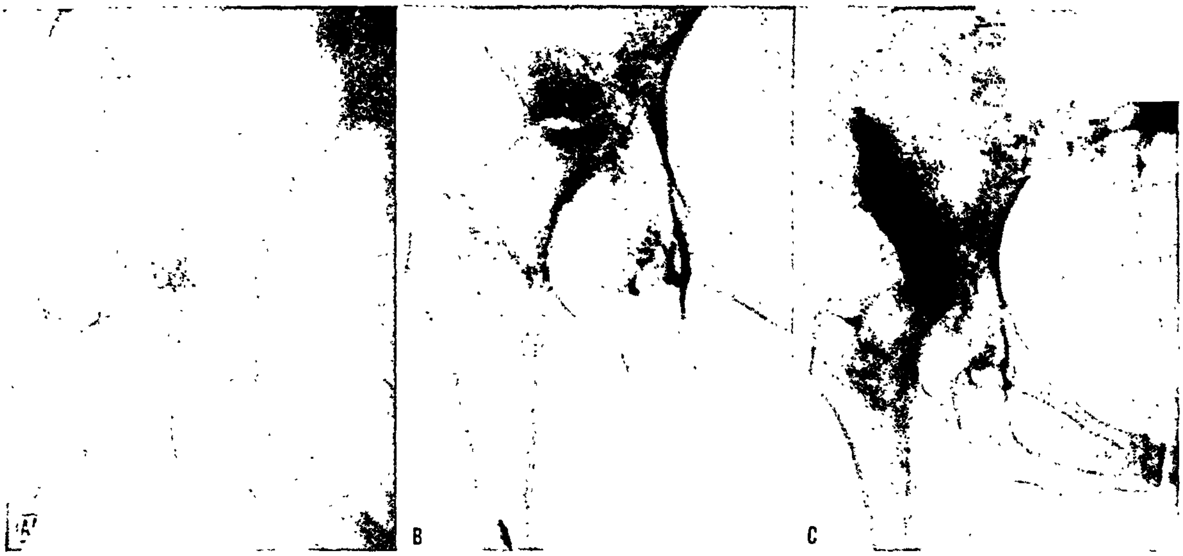

Fig. 4.—Three roentgenograms taken at intervals of a few months, showing reappearance of the cephalic outline and, above all, thickening of what was the internal osteophytosis and the lessened density of the diaphysis blade ending the collar. The osseous webs tend to become homogeneous.

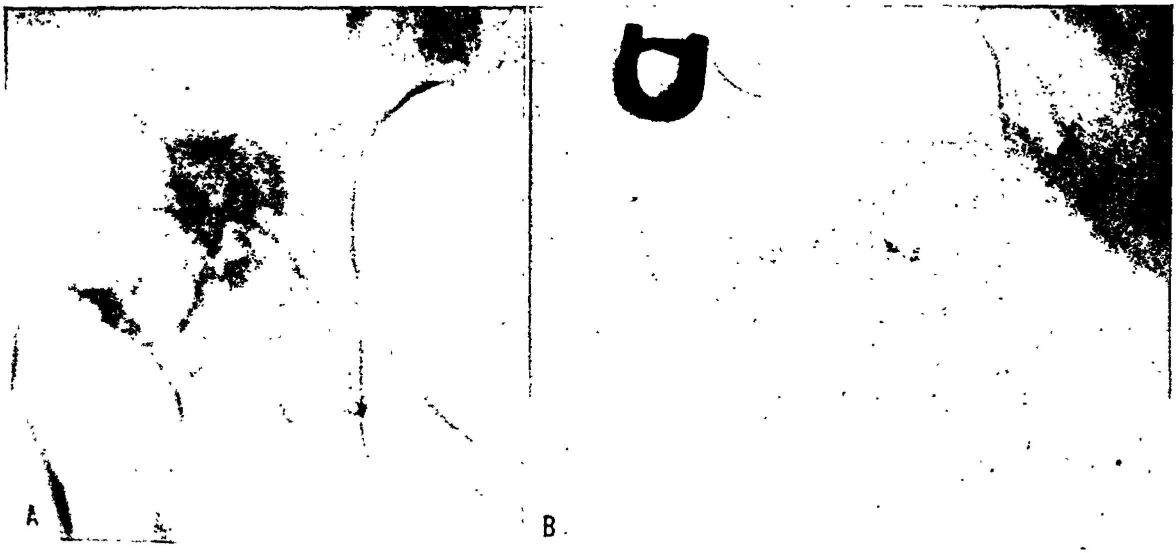

Fig. 5.—*A*, secondary arthrosis connected with vascular phenomena, theoretically an ill-chosen ground for [illegible] arthroplasty. *B*, profile view showing the arrangement of geodes. Preservation of the femoral head is possible here.

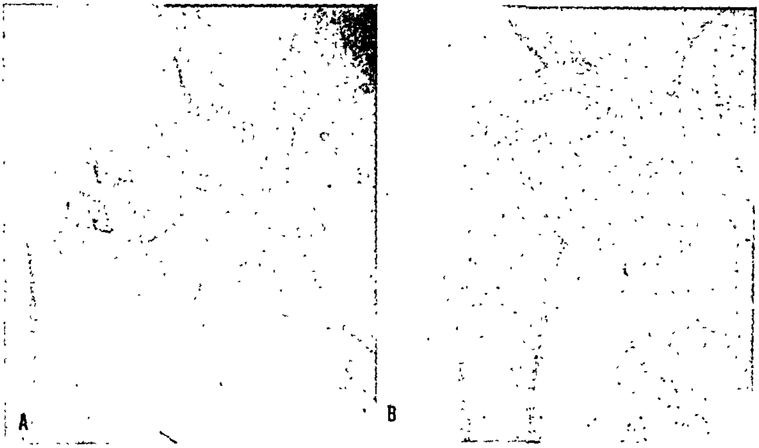

Fig. 6.—*A*, postoperative film: new modeling of the femoral head, not yet covered with cortex. *B*, film taken four months later, with reappearance of the cortex. Note how outline of geodes tends to disappear as function is regained. Therefore geodes are not *a priori* an absolute contraindication with regard to preservation of the femoral head.

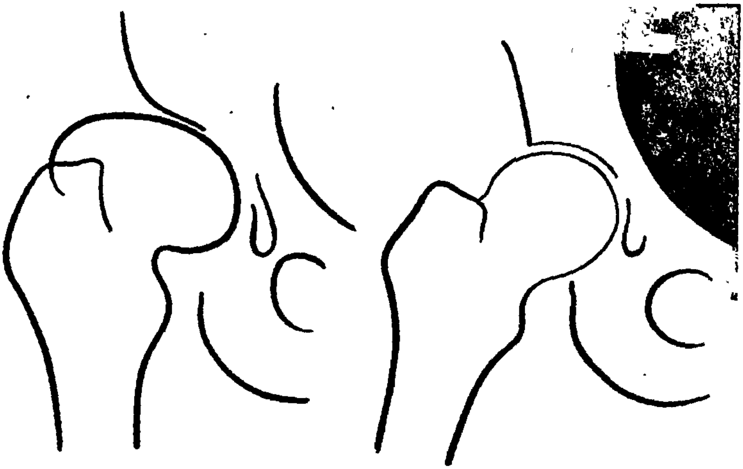

Fig. 7.—Schematic drawing showing exact purpose of remodeling in nylon arthroplasty.

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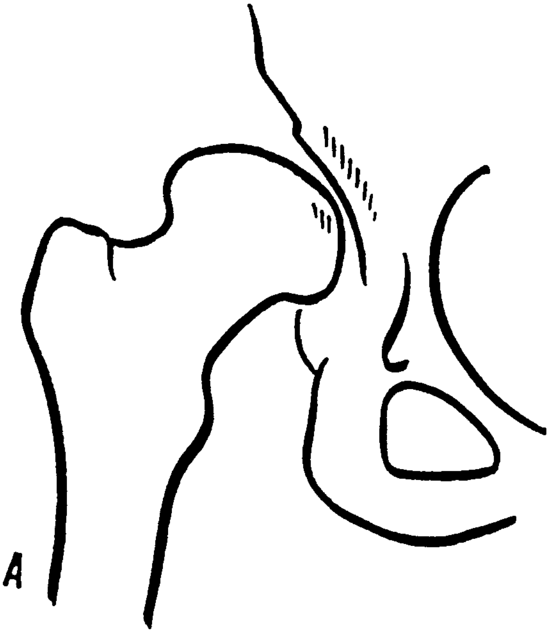

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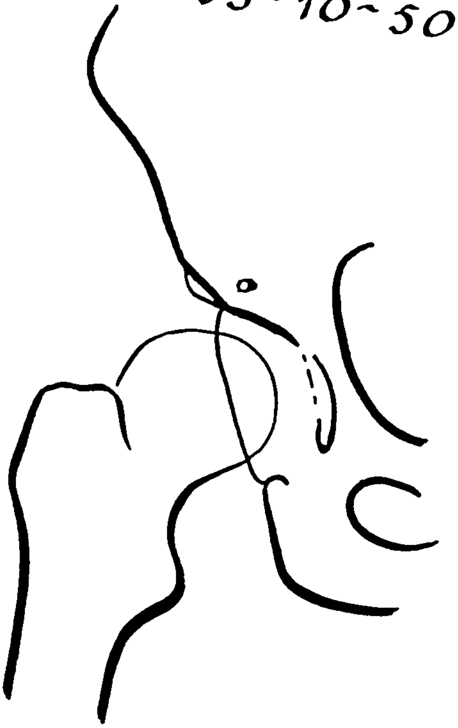

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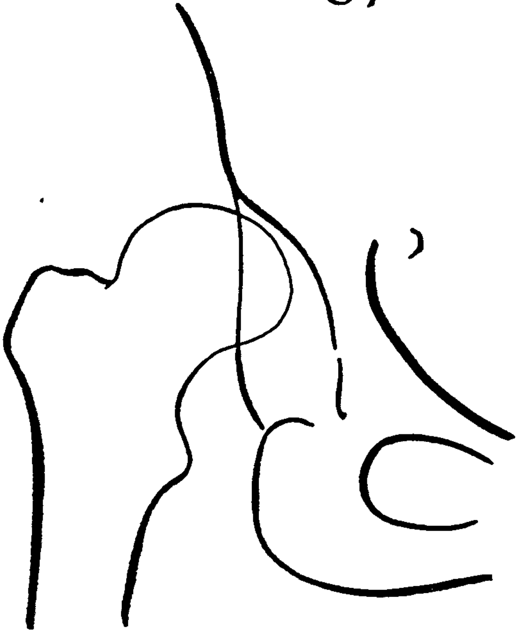

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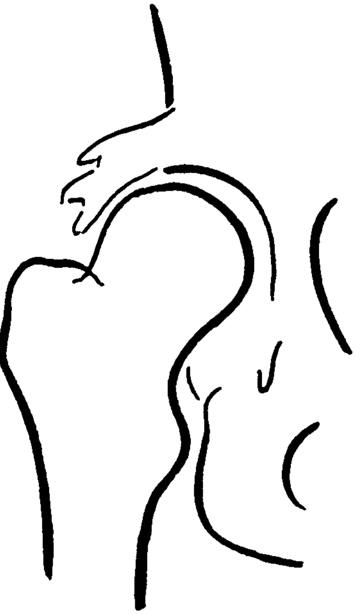

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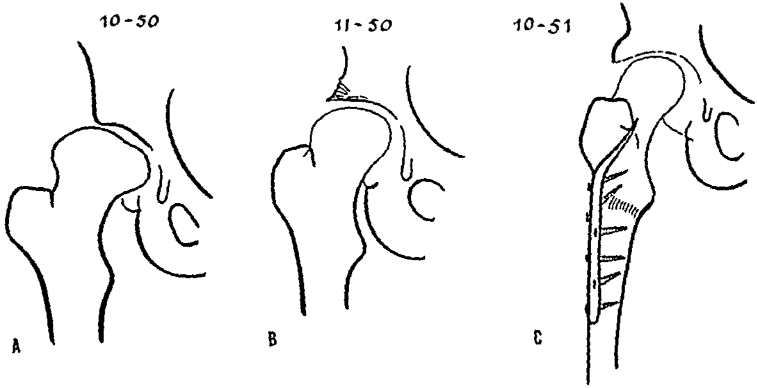

Chart 4 (Case 4).—Roentgen tracings of Mr. M., aged 40. Patient had secondary arthrosis associated with vascular disturbances in an alcoholic field unsuitable for operation. *A*, forepart, front view; *B*, intermediary tracing; *C*, postoperative tracing, front view. Good result in spite of various incidents connected with patient's alcoholism, which made him ill-fitted for reeducation. Walk is satisfactory; mobility is sufficient though limited. An "osteotomy of derotation," the F—shaped callus of which can be seen, was necessary to straighten the foot in external rotation. This case demonstrates the difficulties encountered because of the patient's condition and the operative field. For alcoholics it is perhaps preferable to use an acrylic plastic, though in my opinion this is bound to have a mutilating effect.

as a matter of common sense: while reshaping this spongy bone, one obtains a tissue without a cortex—at least on the greater part of its outline (Fig. 6 *A*). In order to escape destruction, it must not undergo any pressure in any way until endowed by nature with a protective covering (Fig. 6 *B*).

Practically speaking, the foot will not touch the ground again until the end of the second month. Stretching is continued during the night through the first weeks.

Technic.—The technic is that of fascial arthroplasty, which I have described in my book *Modern Surgery of the Hip.** The approach is made laterally through the frontal portion (Fig. 10 *A*). The cut is made along the iliac crest, then down through the outer front part of the thigh opposite the stretching sartorial space of the fascia lata, and curves in its lower portion toward the rear part of the thigh. The stretching sartorial space is located, an iliac plate taken off in the manner of Rocher and the buttocks brought down; the aponeurosis of the fascia lata stretcher is sectioned farther down. A powerful bent retractor resting upon the neck of the femur bends the psoas iliacus inside. As a rule the latter fans out on the forepart of the capsule.

The rectus femoris muscle is sectioned

---

*La Chirurgie Moderne de la Hanche: Apport de la radiographie de Profil. Paris, Doin et Cie, 1948.

Chart 3 (Case 3, opposite).—Roentgen tracings of B. [illegible] with incipient secondary arthrosis. *A*, forepart, front view; *B*, fo [illegible] tracing; [illegible] postoperative tracing, front view. Excellent functional [illegible] ping; [illegible] gen ray shows "lateralization" of the head, well propped against a solid shelf [illegible] y const[illegible] in due time, which completed the treatment. An interesting result, showing [illegible] patient and the surgeon can do. If the complementary shelf operation [illegible] would be a really bad one; this observation shows nature's

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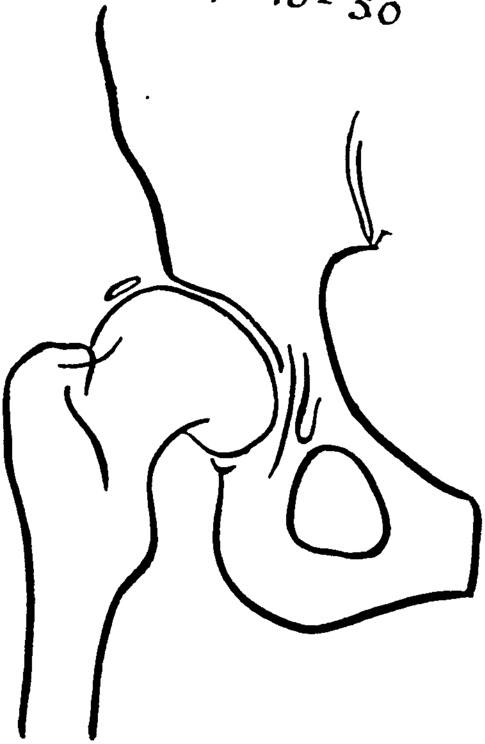

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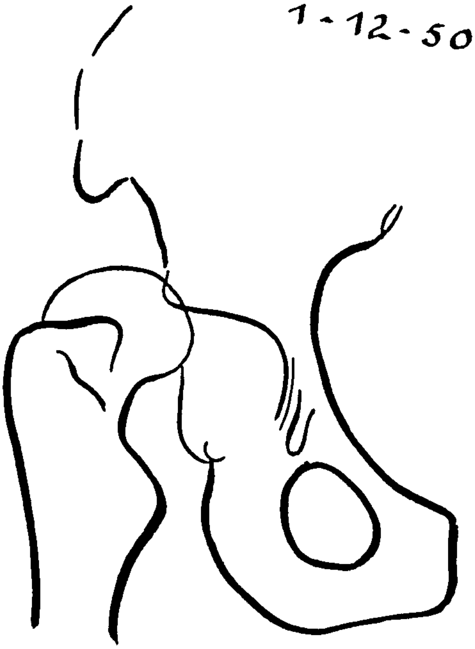

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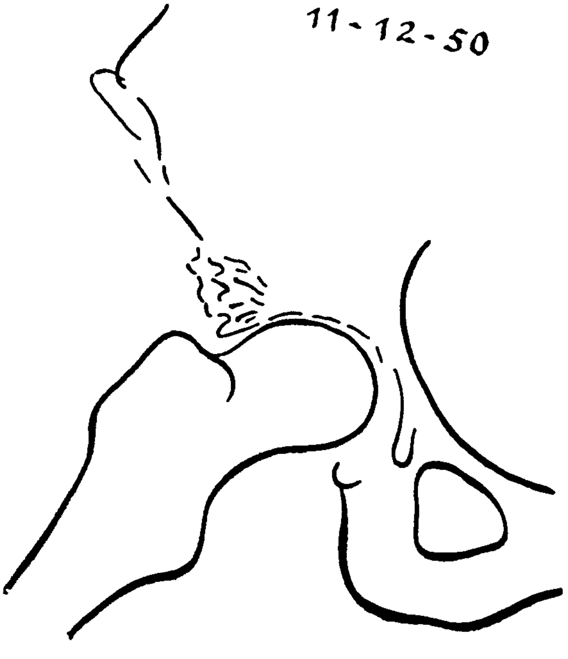

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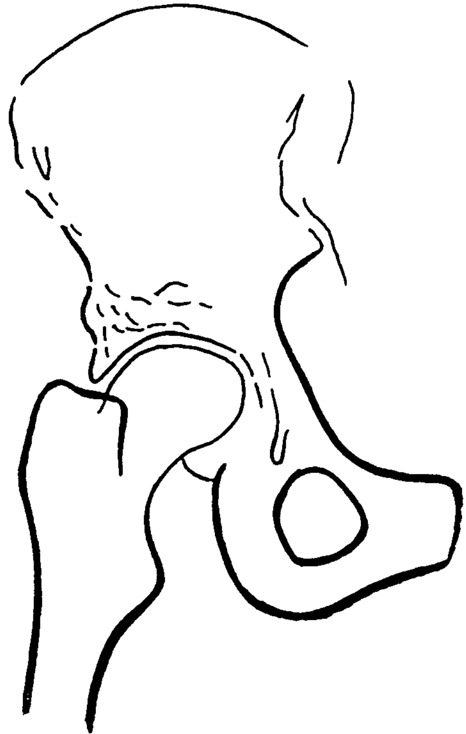


D

at its insertion and bent down. After injection of arthrocain into the joint, the articular capsule is opened into two shutters, which are now brought down with T-shaped pincers. The joint is then widely exposed. The knife should clear the capsule well forward internally. The assistant entrusted with the handling of the lower limb then easily pulls the head out of the acetabulum. After investigation of the lesions, one proceeds to prune the head *by wide cutting with very sharp chisels,* carefully avoiding injury to the cortico-cartilaginous covering of the upper pole of the head (Figs 10 *B* and *C*). *What is* fundamental is to make maximum use of the choice tissue of the "internal osteophytosis" *and preserve most of the solid cephalic* dome; the rest of the altered portion may be widely made away with.

The *reamer produces the spherical* outline of the head reshaped as described. An inventory of the acetabulum is advisable. The thin No. 12 chisel cuts a furrow which will be used in setting to work upon the wall of the acetabulum with Van Nes' chisel (Figs. 11 and 12 *A*), which is easier to handle than Smith-Petersen's. The work is completed with the reamer; the new acetabular aperture obtained in this way must be deep and retentive (Fig. 12 *B*). If necessary, the roof of the acetabulum is dissected and lowered (Fig. 13). When the femoral head has been reintroduced into the acetabulum the latter is kept tied by means of a strong spongy graft taken off the iliac crest.

The *cowling of the head is the next step* in the procedure. It is done with a nylon bonnet prepared beforehand in the size required (Fig. 14 *A*). To this end I make use of an embroidery frame, which makes the work much easier (Fig. 14 *B*). The bonnet, held tight around the femoral neck (Fig. 15), *takes the form of the head,* which is brought back into the acetabulum. The capsule, which I keep carefully in its *fibrous planes, is pulled down and seamed;* all synovial alterations have been resected, of course. The rectus femoris muscle is put back into its place and fastened with catgut sutures. The iliac head is sutured

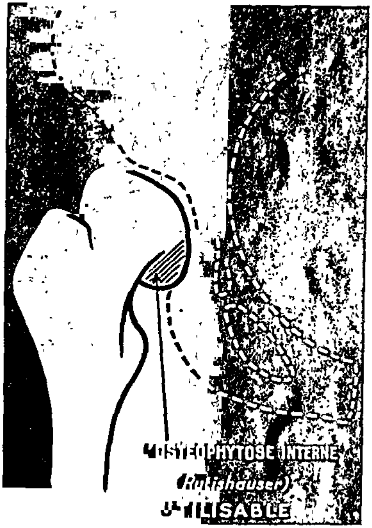


Fig. 8.—Internal osteophytosis described by Rutishauser of Geneva; showing lower internal portion of the frothing femoral head. The tissue is sound and may be used in the technic described. The surgeon should preserve as much of it as possible.

Chart 5 (Case 5, opposite).—Roentgen tracings of Mrs. L., a patient with secondary arthrosis. *A*, forepart, front view; *B* and *C*, intermediary tracings; *D*, postoperative tracing, front view. Good result in spite of an incident that might have been very serious, reluxation of the head while the patient was being carried from the operating table back to bed. Exceptionally, it was not possible to make the roentgen study until after a lapse of eight days. This examination, as a rule, is always done on the operating table (shelf operation). New immediate intervention, completed by lowering of the roof. Mobility regained after a long period of meticulous treatment, well compensated by result; flexibility good; walk in process of becoming excellent. (Roentgen operative examination on the table is necessary when at all possible. Conveying must be performed carefully. This case is an example of what can result from the energy of a patient who wants to get a good result.

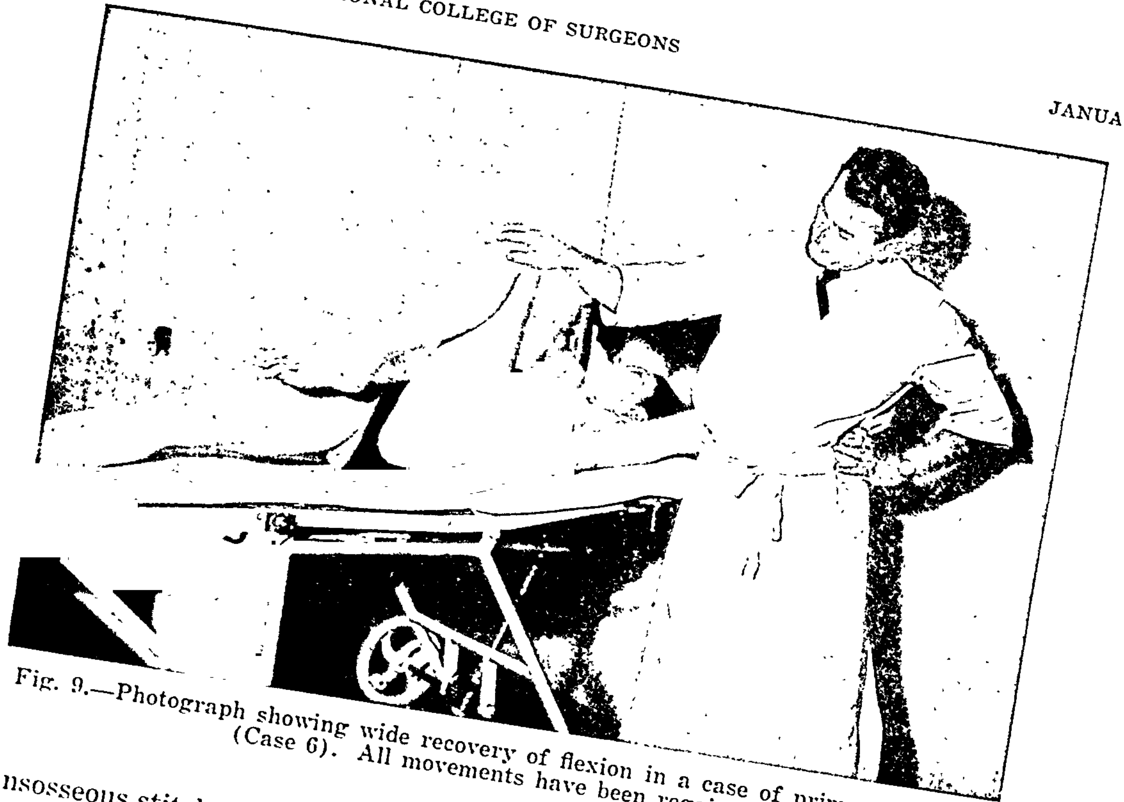


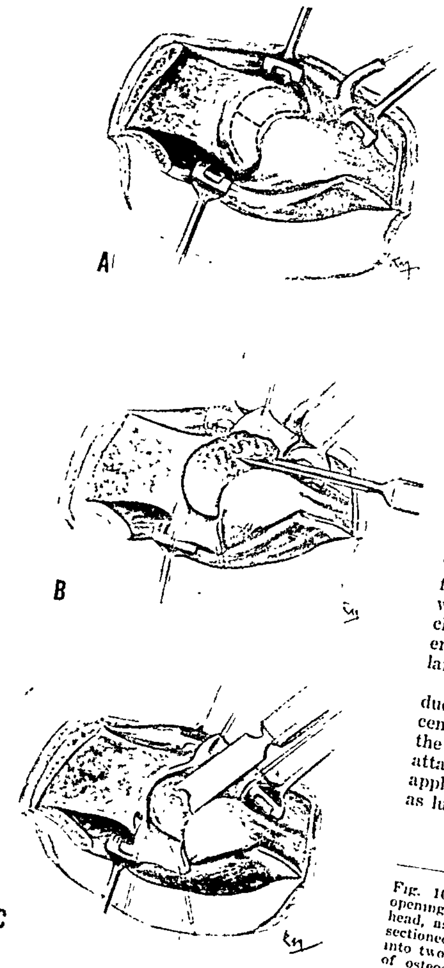
Fig. 9.—Photograph showing wide recovery of flexion in a case of primary arthrosis (Case 6). All movements have been regained.

with transosseous stitches. The fascia lata, the aponeurosis, and the subcutaneous and cutaneous tissues are sutured separately.

The patient is immobilized in plaster for the ten days necessary to obtain good scars, with the limb in abduction or internal rotation. In my opinion, this period of immobility is highly important; it allows the different planes to become properly scarred. Until they become organized, I do not consider it advisable to allow mobility: in any case, experience has proved that the eight "lost" days did not interfere with subsequent mobility—far from it.

Recuperation during the postoperative period (Fig. 1 *C*) is very simple: passive motions of flexion, abduction, adduction, and internal rotation by means of a wooden splint bearing small shells which run on a smooth plane and an autostatic boot worn at night to prevent resumption of external rotation. Pedaling is allowed after three weeks, but I take care not to permit the weight of the body, even if supported by crutches or sticks, to weigh upon the reconstructed joint until the second month at least. What is fundamental during the time of reeducation is the way the patient walks. The patient must not only take up his knee when walking, as this keeps him from dragging his foot; he must also push with his toes to restore hyperextension of the surgically treated thigh, which makes his step as elastic and harmonious as ever. The use of scales hung parallel to the ground and elevated a few inches, in use at the French Re-education Center of Valenton, is very useful for this purpose.

I have been using this method of approach (wide, external, frontal) since 1941 and still use it, for many reasons. First, because in secondary arthrosis the femoral head, almost protruded out of the joint, forms a bulge in Scarpa's triangle, and because I think it logical to cut the opening wherever it finds itself.



The second reason is that the technic allows ample light. The third is that it has no mutilating effect and permits quick recovery. Finally, it is easy to make it wider still if one uses the device shown by Van Nes. It bends the iliac crest toward the midline, kept aside by two long nails well driven into the upper stratum of the ilium.

Very often, as I have said, the dissection and falling of the roof complete the hollowing out of an acetabulum operated upon in the background of the acetabular bowl (Fig. 13). The roof, dissected and made mobile, is supported by a strong triangular graft taken off the iliac crest; its sponginess makes it easy to grasp.

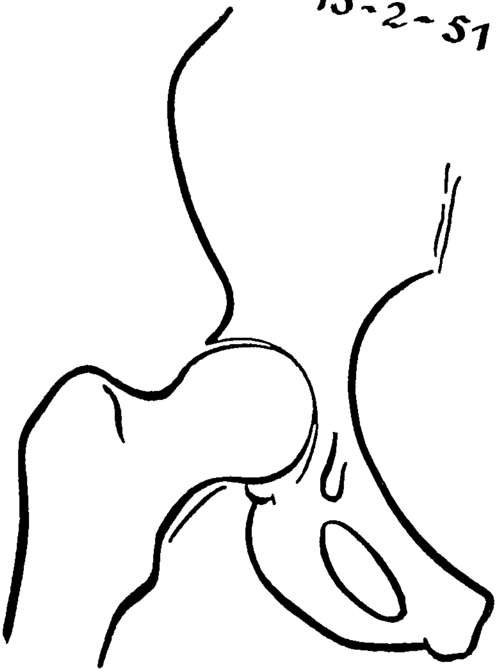
Indications.—One chief use of this procedure is in the treatment of secondary arthrosis; others, less imperative, include vascular coxarthrosis, at least in some instances.

How can one determine the safe limits? Prof. Rutishauser and I are now striving to answer this question. More uses are possible, but they are not without risk. The operation may also be used for inflammatory coxarthrosis—an inadequate word, but it renders faithfully the complex character of some lesions—without apparent periarticular phenomena and without large geodes.

Finally, it can be used for surgical reduction of congenital luxations or adolescent subluxations at the critical time, past the age of 9 years or before full growth is attained, with as many reservations as apply to other methods, because as soon as luxation is present one should not use

Fig. 10 (opposite).—*A*, incision and articular opening. Note large light area on capsule and head, as gluteus muscle is deviated, iliacus and sectioned rectus femoris. *B*, opening of capsule into two shutters. Proliferating cephalic lesions of osteocartilage appear clearly. It is easy to achieve an accurate remodeling with ordinary vision. *C*, remodeling almost completed

15-2-51



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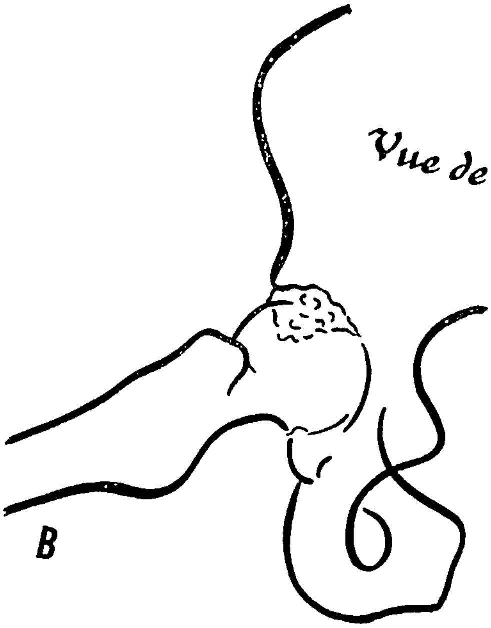

Vue de

B

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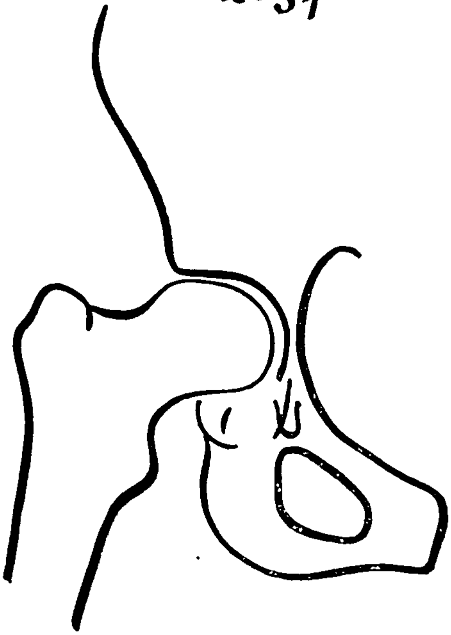

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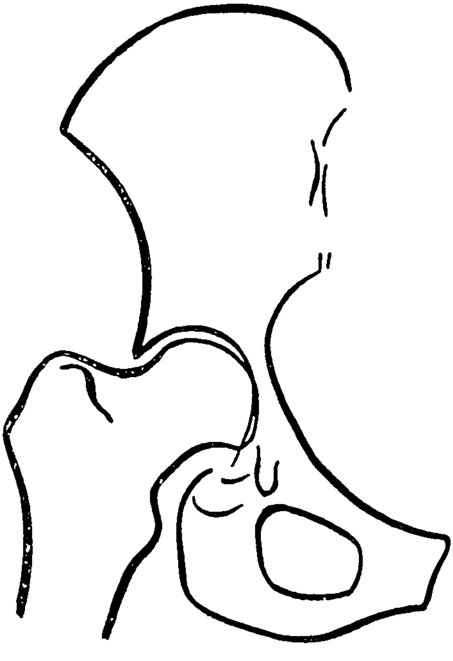


D

Chart 6 (Case 6, opposite).—Roentgen tracings of Mrs. F., aged 30, with primary arthrosis. *A*, forepart, front view; *B*, forepart, profile; *C*, intermediary tracing; *D*, postoperative tracing, front view. Result excellent; nearly complete mobility (see Fig. 14). Flexion, abduction, rotation; sensibility stopped three years after the operation. On examination, it is impossible to say on which side operation was done. Attention is centered on the primary arthrosis. Formerly I considered nylon suitable only for mechanical arthrosis. This paves the way for more extensive studies.

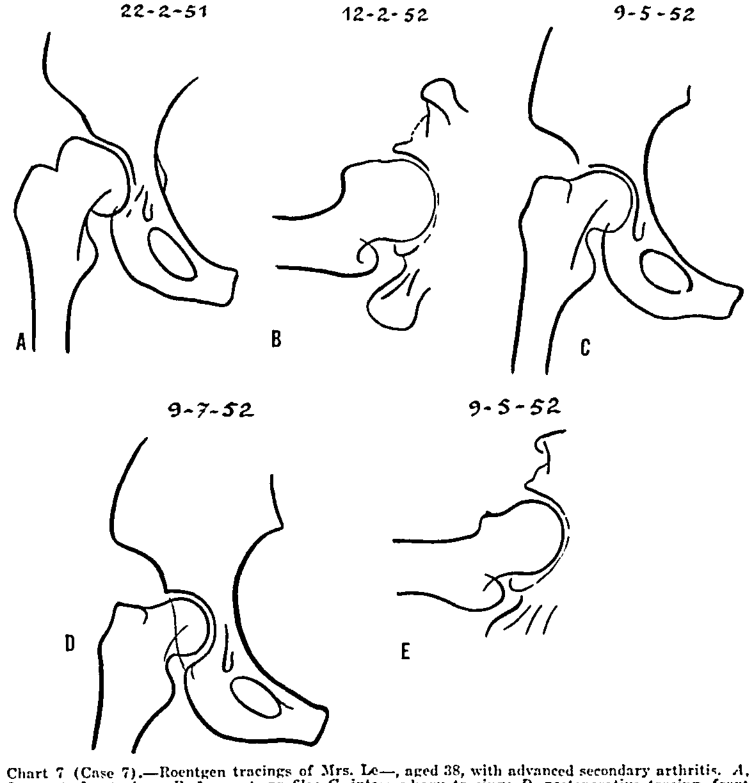
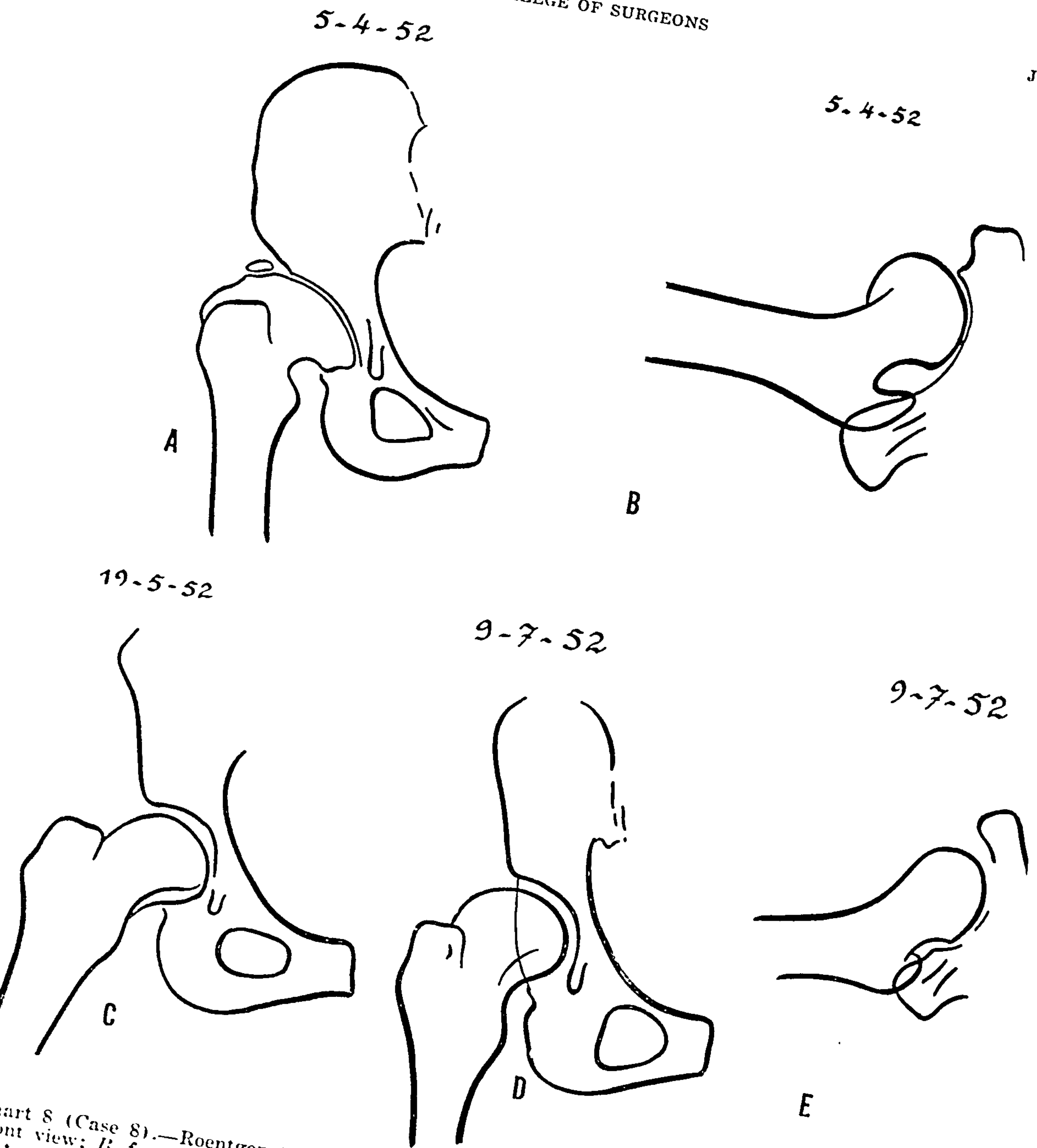


Chart 7 (Case 7).—Roentgen tracings of Mrs. Le—, aged 38, with advanced secondary arthritis. *A*, forepart, front view; *B*, forepart, profile; *C*, intermediary tracing; *D*, postoperative tracing, front view; *E*, postoperative tracing, profile. Excellent result four months after intervention. Mobility almost complete. Pliant gait proves to be quite safe. A magnificent example [illegible] achieved by will power. With this woman the result was reached in a comparativel [illegible] sider [illegible] the technic employed.



art 8 (Case 8).—Roentgen tracings of Mrs. F., aged 38, with secondary arthrosis. *A*, forepart, ont view; *B*, forepart, profile; *C*, intermediary tracing; *D*, postoperative tracing, front view; *E*, toperative tracing, profile. Result not yet complete. Morphologic picture perfect. Mobility in a y good way to recovery. Muscle strength will be regained slowly because preoperative atrophy was considerable. Observation is still in progress; it is difficult to come to a conclusion.

he femoral head tends toward destruction by compressive ulceration.

e use of this method (except for coxny) also depends partly on the appearance shown by a side view (Fig. 5 B), which reveals, when seen from another angle, the true condition of the preserved osseous body of the femoral head and per-

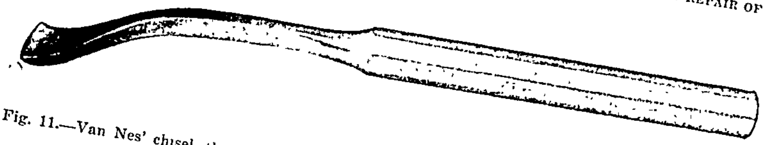


Fig. 11.—Van Nes' chisel, the efficient handling of which allows hollowing of the acetabulum where desired.

mits one to decide how to utilize it.

Results.—On the whole, the results thus far carry conviction. Since 1949 I have encountered only 11 cases (see table), but study of the observations thereon permits the setting up of certain rules, which may become less restricted in the future. A summary of these 11 cases is given. They include 9 cases of secondary arthrosis, 1 of primary arthrosis and 1 of inveterate congenital subluxation.

Of the 9 secondary arthroses, a perfect functional anatomic result was obtained in 2 (Cases 5 and 8); an excellent functional result in 1 (Case 7). One is in course of treatment, and already a very good functional result is apparent (Case 11). In one other, also in course of treatment, the patient is very unmanageable (Case 9). There was 1 case of vascular arthrosis associated with vascular phenomena and huge geodes (Fig. 5 *A*) in a highly alcoholic field (Case 2) the result, however, is very good (Fig. 6 *B*) but will have to be completed by rotation osteotomy, as indicated by the important malformation of the upper end of the femur.

In 1 case of secondary arthrosis kinking was present, with congestive and vascular phenomena in an alcoholic field. The result after reparation osteotomy may be considered encouraging, because the pain is gone, the position of the limb is normal and the support is excellent, though flexibility is still inadequate (Case 4). Such conditions occurring in such a field are ill fitted for any kind of arthroplasty.

In 1 case of secondary arthrosis incipiens in an inveterate congenital luxation with large lateral displacement, the patient being a woman aged 20, the result is excellent; but failing to low

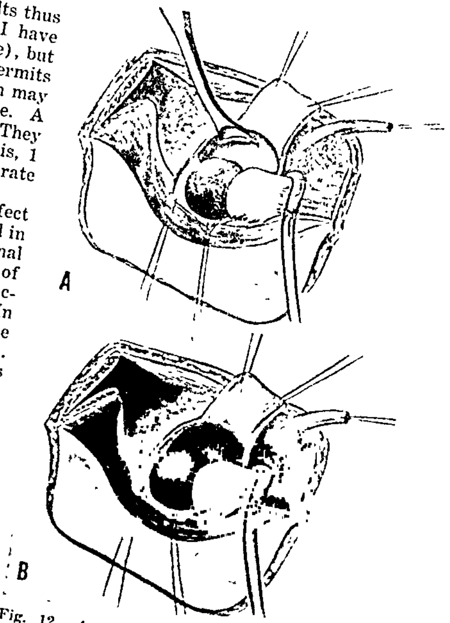
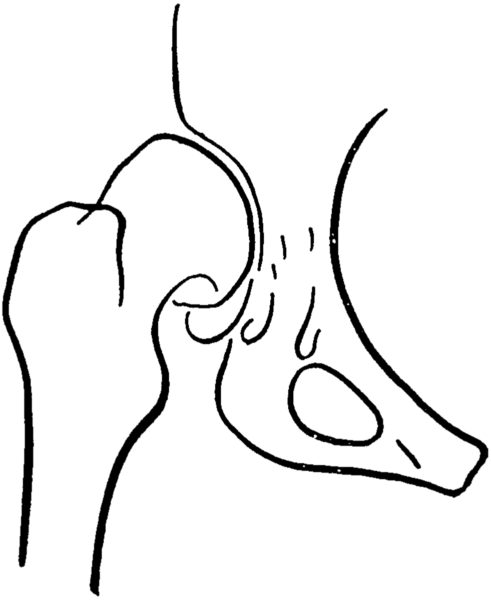


Fig. 12.—*A*, hollowing with Van Nes' chisel, started after investigation of the worn acetabulum. *B*, hollowing completed. The acetabulum is deep and regular.

7-3-52



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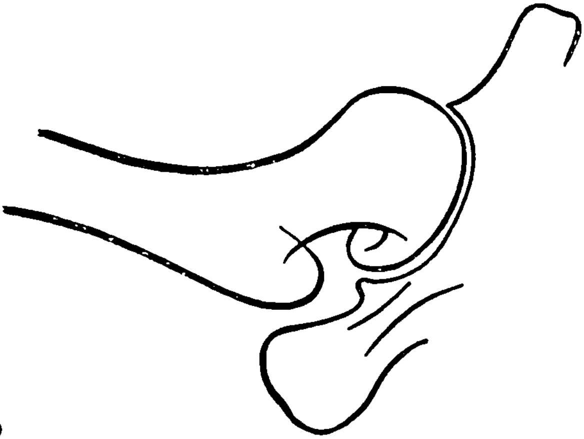

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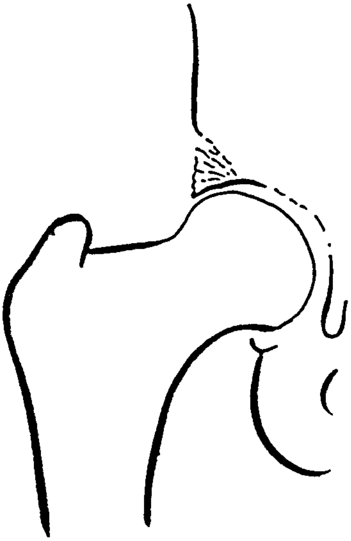

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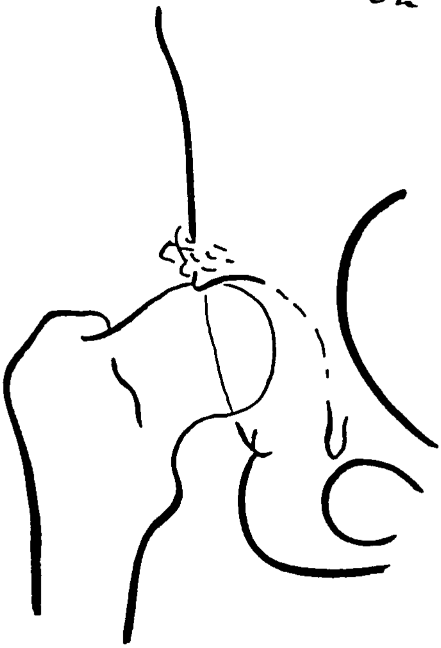

D

Chart 9 (Case 9, opposite).—Roentgen tracings of Miss La—, aged 30. Secondary arthrosis with inveterate congenital subluxation. *A*, forepart, front view; *B*, forepart, profile; *C* and *D*, intermediary tracings. Treatment still in progress, result pending. Modeling was perfect. Owing to intractability of patient a slight secondary deviation of the head occurred. Final result is likely to be good, as in Case 3, provided neurotomy is performed—and a complementary support too, perhaps. An interesting case, for it shows how intractability of the patient may influence the result. Here the lateral deviation may be corrected. Normally it should have been avoided. The undisciplined patient did not submit well enough to postoperative treatment, a particularly trying one in her case.

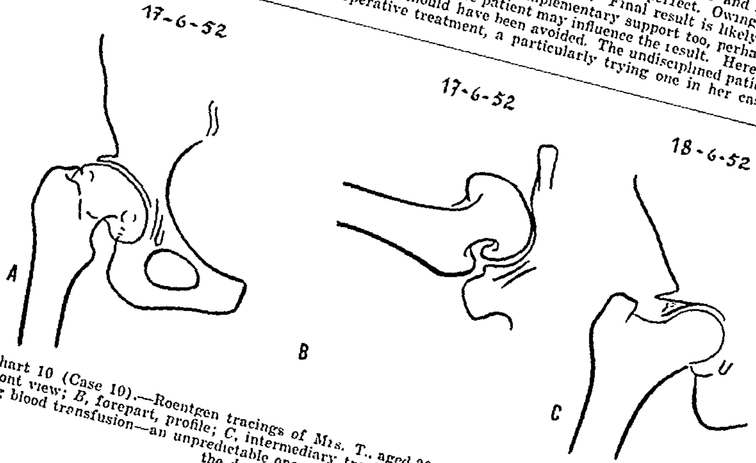

Chart 10 (Case 10).—Roentgen tracings of Mrs. T., aged 30; with secondary arthrosis. *A*, forepart, front view; *B*, forepart, profile; *C*, intermediary tracing. Unfortunately, an accident occurring during blood transfusion—an unpredictable one, every precaution having been taken beforehand—caused the death of this patient ten days later.

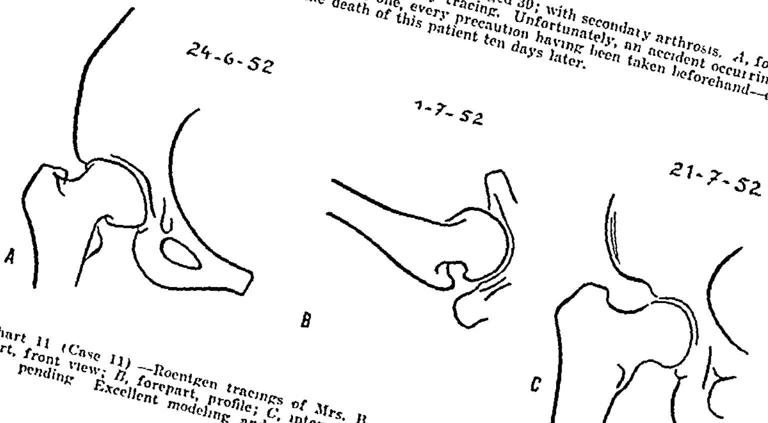

Chart 11 (Case 11).—Roentgen tracings of Mrs. B., aged 35, with secondary arthrosis. *A*, forepart, front view; *B*, forepart, profile; *C*, intermediary tracing. Treatment still in progress, result pending. Excellent modeling and morphologic aspect. Conclusion would be premature.

Analysis of Eleven Cases

Case No.	*Patient*	*Age*	*Type of Lesion*	*Result*
1	Miss M.	14	Inveterate congenital arthrosis	Excellent mobility
2	Mrs. P.	50	Secondary arthrosis with vascular disturbances	Good; would be improved by derotation osteotomy (see Chart 2)
3	Mrs. B.		Inveterate congenital subluxation with incipient secondary arthrosis	Functionally excellent; complete mobility (see Chart 3)
4	Mr. M.	40	Secondary arthrosis; vascular disturbances; alcoholism	Good despite poor operative field (see Chart 4)
5	Mrs. L.		Secondary arthrosis	Good despite accident causing relaxation (see Chart 5)
6	Mrs. F.	30	Primary arthrosis	Excellent; almost complete mobility (see Chart 6)
7	Mrs. Le	38	Advanced secondary arthritis	Excellent; mobility almost complete four months after operation (see Chart 7)
8	Mrs. F.	38	Secondary arthrosis	Result incomplete; morphologic picture perfect; treatment still in progress (see Chart 8)
9	Mrs. La	30	Secondary arthrosis with inveterate congenital subluxation	Treatment still in progress; modeling perfect; neurotomy will probably be necessary, as well as a complementary support (see Chart 9)
10	Mrs. T.	30	Secondary arthrosis	Unpredictable accident during transfusion caused death (see Chart 10)
11	Mrs. B.	35	Secondary arthrosis	Treatment still in progress. Excellent modeling and morphologic aspect (see Chart 11)

sect the near roof because I had to finish quickly owing to an incident during the reanimation process, I planned new intervention during convalescence to provide a support. The result proved excellent after all (Case 3).

Twice, indeed, I should have connected reconstruction with a lowering of the roof from the very first. I did it secondarily, under compulsion. I was wrong; nylon vas not responsible for it; I was (Cases and 5).

In 1 case, which I have cited already ase 2), owing to the fact that the feoral head was turned forward, I should ve used derotation, but I failed to do it. e patient is still under treatment; the ult, although actually very good, will improved when the patient, a woman, submits to it. Such derotation used together with my osteotomy and synthesis, without immobility in a plaster, carries no bad consequences such as Blount and Milch have shown in the United States.

In 1 instance, perhaps, I should not have used this kind of arthroplasty. The condition was fundamental arthrosis (Case 6). I did use it, however, and although convalescence was slow the case ended in total mobility, this function being quite comparable with that of the sound side. Some sensibility continued but was in a fair way to disappear two years later. This taught me the possible uses and limitations of the process, in a case of this sort, but more patience and a longer convalescence are required.

Inveterate congenital subluxation in an

adolescent girl (Case 1) was followed by complete flexibility, but also by hypotrophy of the quadriceps (rectus femoris) following an operative incident pinching of the nervous pedicle, for which nylon cannot be held responsible.

The use of nylon, however, is inadvisable while growth is in progress, for it is likely to cause gradual hollowing out of the cotyle, which is undesirable.

In short, as I have said, the results in 7 instances has been complete or nearly complete recovery of all motions. The reconstruction produces a shape similar to that of a normal hip. Of these 7 cases, 5 are cases of arthrosis, 1 a case of primary arthrosis, and the seventh a case of co genital subluxation.

In 2 cases, since treatment is still i progress, the results cannot be considered final. In 1 the result cannot be considered valid owing to the unsatisfactory field in which I operated.

The accompanying table presents data on the eleventh case, which cannot be analyzed, owing to premature death.

As to the subjective factor: the patient's opinion of the result in every case is excellent. I am more critical.

Finally, the operation is performed with a view to the future. It preserves the femoral head, and all subsequent necessary

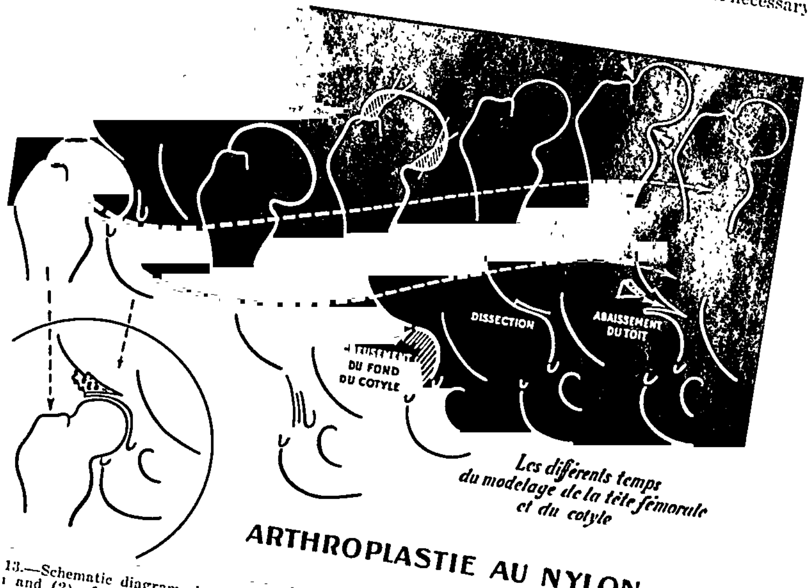

Fig. 13.—Schematic diagram showing to what purpose the remodeling (1) of the upper end of the femur and (2) of the acetabulum is done by nylon arthroplasty. Often the acetabulum, hollowed out at its background level, will become retentive if one dissects the roof, lowers it and keeps it down by means of a trapezoid graft taken off the iliac crest, a spongy tissue very easy to handle.

FIG. 14. A, nylon cowl provided with two tightening links. *B*, nylon film that has been previously ap-
[illegible] an embroidery frame, which stretches it. It thus becomes easy to baste a thread for tighten

interventions remain possible. This, in my opinion, shows that it is superior to other technics. It has the great advantage of tending to remake a physiologic articulalation. Surely it is the ideal of a surgeon to build new material out of osseous living tissue, using the internal osteophytosis, the value of which equals that of new bone (Rutishauser; Grasset), without artifice other than introduction of the necessary agent, reduced here to the strictest minimum—a nylon film.

SUMMARY

The author describes a technic for nylon plastic reconstruction of the hip. The procedure preserves the femoral head and offers no obstacle to any subsequent procedures that may become necessary. Eleven cases are reported in which this technic was employed, with highly encouraging results in nearly all. Some patients are still under treatment.

RÉSUMÉ

L'auteur se sert de nylon pour la reconstruction plastique de la hanche. Ce procédé conserve la tête du fémur et n'empêche aucun traitement subséquent.

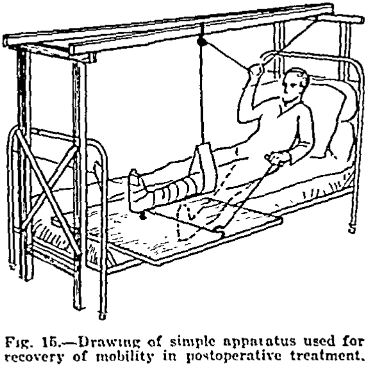

Fig. 15.—Drawing of simple apparatus used for recovery of mobility in postoperative treatment.

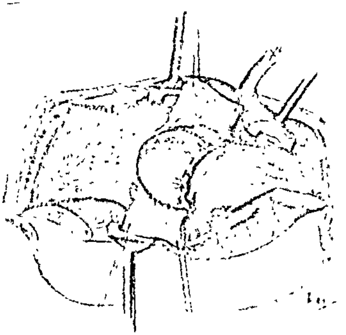

Fig. 16.—Remodeled head capped with the nylon cowl previously prepared, fastened by a thread stitched on its contour. Thus capped, the head will be brought back into the hollowed acetabulum.

RIASSUNTO

L'autore descrive una tecnica per la ricostruzione plastica dell'anca con l'uso del nylon. La tecnica preserva la testa del femore e non ostacola altre eventuali terapie.

SUMÁRIO

O autôr descreve uma técnica para reconstituição plástica do quadril, com o uso do "nylon." O processo conserva a "cabeça" do femur e não oferece dificuldade alguma ao emprego de outro qualquer metodo de tratamento que se venha a tornar necessário.

ZUSAMMENFASSUNG

Der Verfasser beschreibt eine Technik des plastischen Wiederaufbaus der Huefte unter Verwendung von Nylon. Das Verfahren sichert die Erhaltung des Oberschenkelkopfes und schafft keine Hindernisse fuer etwa erforderliche spaetere Massnahmen.

RESUMEN

El autor describe una técnica para reconstrucción plástica de la cadera con el uso de nylon. El procedimiento preserva la cabeza femoral y no ofrece obstáculo a cualquier otro subsiguiente que pudiera hacerse necesario.

NINTH INTERNATIONAL CONGRESS, 1954

Under the Sponsorship of the Brazilian Government

Notice to All Members of the International College of Surgeons:

The House of Delegates on May 9, 1952, in Madrid, Spain, decided that the City of São Paulo would be the meeting place of the next International Congress, approving the suggestion of His Excellency the Governor of the State, Prof. Dr. Lucas Nogueira Garcez. Brazilian members of the Board of Trustees were appointed to the Commission organizing the Congress, under the direction of Prof. Dr. Carlos Gama, Vice-President of the International Congress and Secretary General for South America.

The Ninth International Congress will be held from April 26 to May 2, 1954. The official topics are (1) experience with socialized medicine in different countries, (2) new uses of radiology with contrast media in the various surgical specialties, and (3) experience with antibiotics in all branches of surgery.

Since the Ninth International Congress will coincide with the Fourth Centennial of the city of São Paulo, it is hoped that the conference, in addition to being one of the most memorable ever held, will add much to the commemorative activities of São Paulo. In order that the Commission may obtain in advance a satisfactory idea of the number who will attend, to arrange the best possible accommodations for them and to insure that the program shall be absolutely functional, all who are interested are requested to write to the address below.

—Prof. Dr. Carlos Gama, Secretaria, Praca Ramos de Azevedo, 7.° Andar,
Sala 710, São Paulo, Brazil.

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Malignant Disease of the Urinary Bladder

MICHAEL K. O'HEERON, M.D., F.A.C.S., F.I.C.S.
ROY RIDDEL, M.D., JAMES BOZZELL, M.D.
JACK ROBISON, M.D., and ROBERT SATTERLEE, M.D.
HOUSTON, TEXAS

THE management of malignant disease of the urinary bladder is one of the most difficult problems in urology. ts difficulty is increased by the functional ssentiality of the bladder, the invasive tendency of the neoplasm, and the failure of the profession to find or develop a sat-sfactory substitute for the bladder when otal extirpation is necessary.

The problem is essentially the same whether one is dealing with private or clinic patients. The cancerophobic public has provided the opportunity to diagnose earlier than was the case a few years ago. The work of the lay organizations dealing with cancer has been so effective that nearly every housewife and school child knows the seven signs of cancer. As a group, private patients are responsible persons, and they do seek medical advice early. On the other hand, a few of our private patients tend to procrastinate and postpone needed medical attention until their distress or accumulated concern drives them to a physician. The family physician is usually called first, and if the presenting symptom is gross hematuria, as it is in 80 to 90 per cent of all cases, he will probably call in a urologist immediately. If the presenting symptom is not hematuria, it is understandable that there may be some delay in arriving at the correct diagnosis.

The incidence of neoplasms of the bladder increases rapidly among persons past the age of 40. In children and young adults they are rare, but in the middle and older age groups they are common enough to be among the first possibilities considered when a patient reports gross, painless, hematuria. Higgins[1] stated that adult male patients with hematuria have a papilloma or a carcinoma of the urinary bladder in 50 per cent of all cases, but in women inflammation is a more common cause of the hematuria. Ewing[2] has stated that vesical neoplasms constitute from 0.25 to 0.96 per cent of all the new growths afflicting man. He further stated that they are three times as common in men as in women. Deming[3] studied 407 patients covering a period of twenty-seven years and found 109 patients with what he considered benign papilloma. Of these, 73 per cent were male, an approximate ratio of 3 to 1. As has been pointed out by Deming and others, this would suggest a hormonal influence, but estrogenic therapy administered to male patients has not been very convincing. In 86 per cent of Deming's patients of both sexes the lesion occurred between the ages of 50 and 60. The general age in our series for men was 60 to 70 and for women 55 to 65. In only 10 per cent of our male patients did the neoplasms occur before the age of 45, and only 1 woman was under 45.

Milner,[4] Marshall and Whitemore,[5] as well as others, have presented studies in which the incidence of bladder tumors is in agreement with the statistics given by Deming and Ewing.

Scientific knowledge concerning the cause of bladder tumors is very limited. Local irritation may, in some instances, be a factor. Rolnick[6] has some excellent diagrams (Fig. 1) showing the

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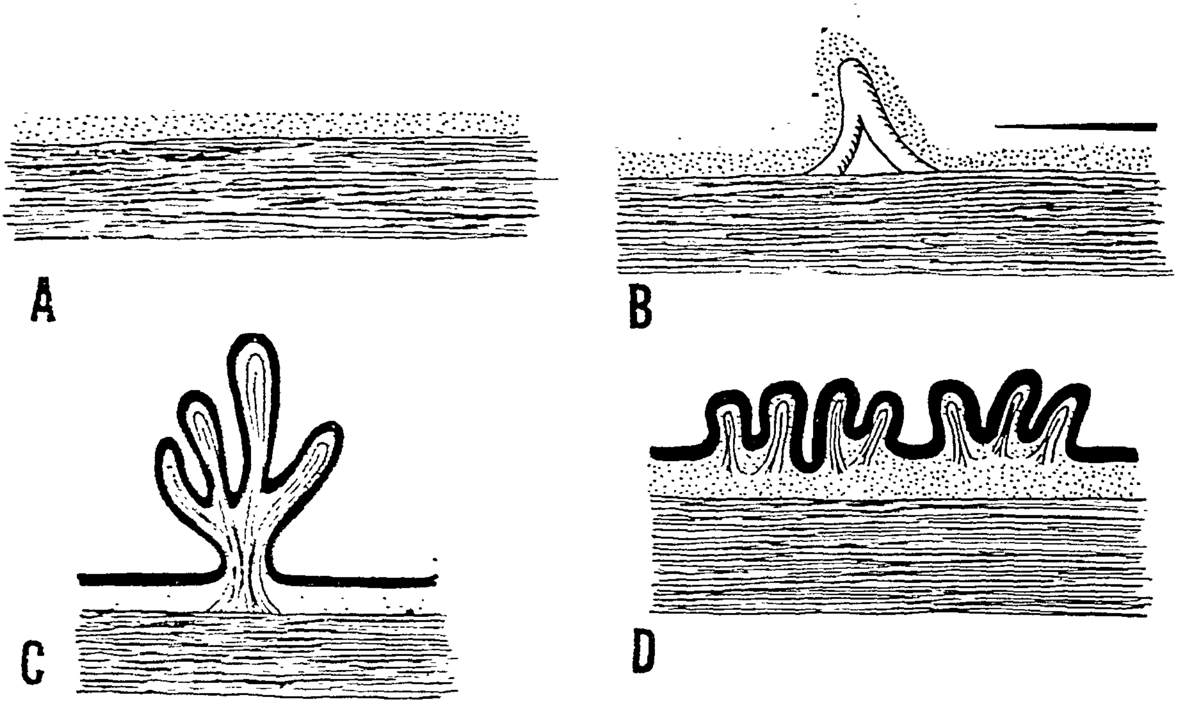

Fig. 1. –Formation of projections of the mucous membrane of the urinary bladder, somewhat suggestive of papillae, as a result of chronic irritation (Rolnick[5]).

the vesical mucous membrane to form projections, somewhat suggestive of papillae when subjected to irritation. He (Rolnick) has pointed out that epithelial buds, the so-called cell nests of von Brunn (Fig. 2), either occur in the normal mucous membrane of the bladder or result from irritation to it. Continued irritation will result in cyst formation, the so-called cystitis cystica (Fig. 3). Later stages in this process are "cystitis glandularis" (Fig. 4) and "cystitis follicularis" (Fig. 5). Squamous cell metaplasia (Fig. 6) of the mucous membrane may result from continued irritation. The proper role of these various lesions in the formation of bladder neoplasms is not well understood, but they are worthy of consideration. The irritants that have been named as etiologic agents are coal tar products, chronic irritations, and bilharziasis. Among workers who have been exposed to aniline dyes for a period of years the incidence of vesical papilloma or papillary carcinoma is known to be high. It is believed that the chronically irritated urinary bladder exhibits an increased tendency to tumor formation. This may develop along one of two lines: a transitional cell papillary tumor may form, or the normal transitional epithelium may undergo squamous metaplasia, followed by squamous cell carcinoma.

The majority of urologists today classify bladder neoplasms as either papillary or nonpapillary. This practical classification is of little value to the pathologist, but it serves as a valuable working tool for the practicing urologist charged with the responsibility of managing the disease. In using this classification we usually assume that the papillary growth is benign or of a low degree of malignancy, and that it has little or no invasiveness. The nonpapillary tumor, on the contrary, is usually invasive, and the degree of malignancy is proportionally higher. Flocks[7] has classified them as (1) papillary tumors, (2) infiltrating tumors confined to the bladder and (3) infiltrating tumors extending beyond the bladder.

Milner[1] has classified them as papillary and epidermoid. By epidermoid tumors he refers to the nonpapillary, infiltrating growths. One of the most complete classifications is the one by McCrea[8] in his book *Clinical Cystoscopy*. He has listed the various growths under one of three headings, epithelial, mesothelial or teratoid. Rolnick has presented a similar but simpler classification in his new textbook.[6] According to Hinman[9] and others, 95 per cent of all bladder tumors are from epithelial tissue. The remaining 5 per cent are either of mesothelial or of heterotopic origin.

Jewett and Strong[10] made a study of infiltrating carcinoma of the bladder with respect to the relationship of the depth of penetration of the bladder wall to the incidence of local extension and metastasis. The basis of their study was a series of 107 autopsy cases. In order to describe the degree of infiltration they classified the neoplasms into three groups as follows (Fig 7): Group A. Involvement of the mucosa but not the muscularis. Group B. Infiltration into the muscularis but not through it. Group C. Perivesical infiltration by the neoplasm.

They estimated the potential curability of the various groups as follows: Group A, 100 per cent; Group B, 86.6 per cent, and Group C, 26 per cent. An accurate grouping of patients in one of these categories would simplify the selection of the proper line of therapy. Clinically, the problem is accurate determination of the degree of infiltration before operation is performed.

In our pretreatment study of bladder

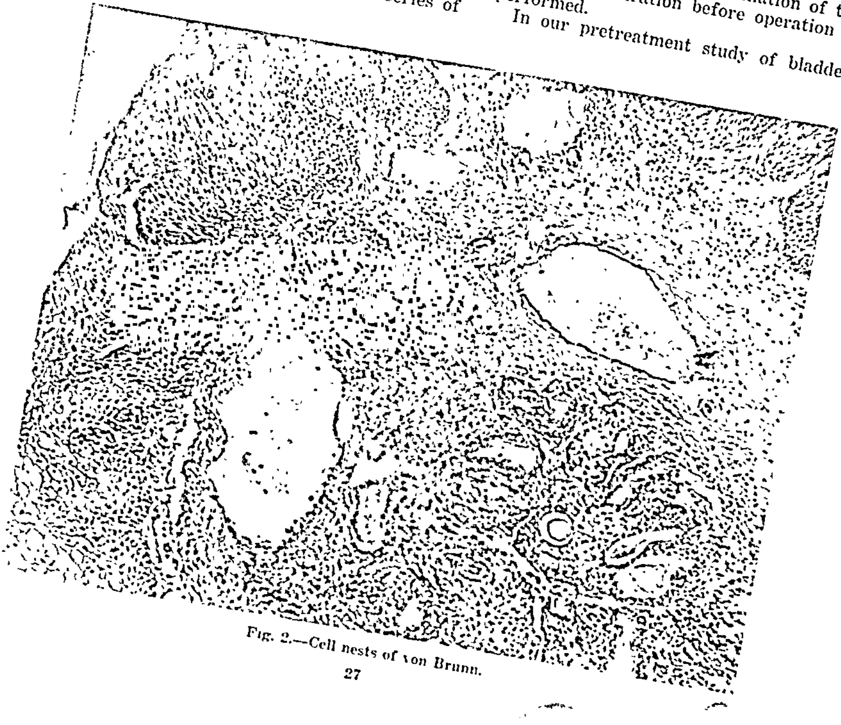

FIG. 2.—Cell nests of von Brunn.

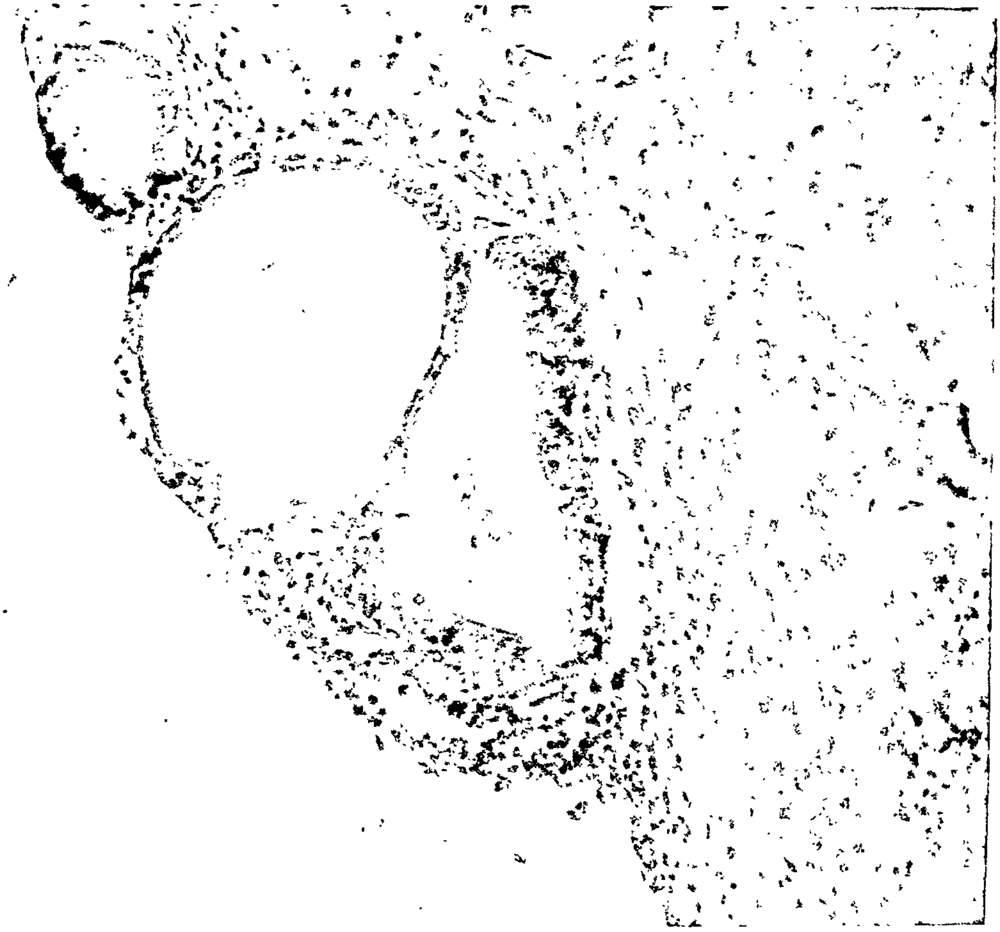

Fig. 3.—Cystitis cystica.

tumors we use the classification in Table 1. This is an attempt to correlate the cystoscopic data with the degree of invasion and the accessibility of the tumor or tumors. We realize that this classification is very general, and that, while it may apply to the largest per cent of the groups considered, it will not be true in every individual case.

Papillary tumors with long narrow stalks are usually benign or of a low grade of malignancy and confined to the mucosa. The shorter the stalk and the broader the base, the greater is the probability of infiltration into the muscularis; also, the degree of malignancy is usually greater. Recurrent papillary tumors present a special problem. Some papillomas may recur over and over again without evident change in the degree of either malignancy or infiltration, while others will exhibit a marked increase in both with each recurrence. All recurrent papillary tumors of the bladder should be considered potentially more invasive than the previous lesion.

Multiple papillomas may not be invasive and may show little, if any, evidence of malignancy, but by their multiplicity they present a greater technical problem. Their eradication is more difficult, and the need for future cystoscopic checks is greater. When multiple papillomas are invasive, the problem is increased in direct proportion to the number of papillomas present. Various urologists have stated their opinions as to the number of papillomas in a bladder that should be managed by conservative means. Dean[11] suggested that in most cases one should not attempt to handle multiple papillomas by electrocoagulation if there are more than 15 tumors. Other authors have placed the number as low as 10. Multiple recurrent papillomas offer a more serious prognosis than do single recurrent ones.

The nonpapillary tumors are usually highly invasive and are infiltrating the muscularis at the time they are discovered, even though the degree of malignancy may not be exceptional. The depth of infiltration is often directly proportional to the diameter of the tumor. A tumor with a diameter of 1 cm. or less may not have invaded far into the muscularis, while one measuring 3 cm. or more will have invaded deeply.

TABLE 1.—*Classification of Vesical Tumors by Cystoscopic Appearance*

Papillary	Narrow Stalk	Single	Location
		Multiple	Location
	Broad Base	Single	Location
		Multiple	Location
	Recurrent	Single	Location
		Multiple	Location
Non-papillary	Small (3 cm. or less)		Location
	Large (over 3 cm.)		Location

The location of tumors, either papillary or nonpapillary, is highly important. There is probably little, if any, correlation between the location of a tumor of the bladder and the degree of malignancy and infiltration. However, location is important from the standpoint of accessi-

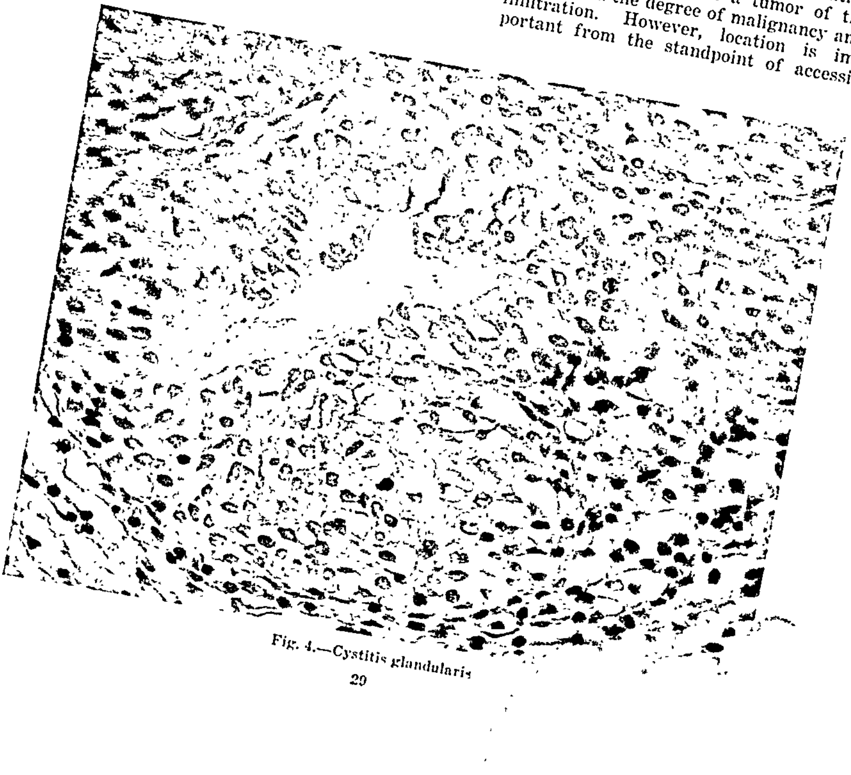

Fig. 4.—Cystitis glandularis

bility of the tumor, and also because of the ability of tumors to interfere with certain functions of the bladder. For instance, a tumor on the posterior wall of the bladder is easier to destroy by electrocoagulation than is one on the anterior wall. A tumor in the dome, on the lateral or posterior wall, is easily removed by partial cystectomy, while one on the trigone, over a ureteral orifice or at the internal vesical orifice, presents a more complicated anatomic and physiologic problem. The problem is further increased by the fact that 65 per cent of all bladder tumors are located in the basal area.

Figure 8 is an attempt to correlate the various grades of malignancy of papillary carcinomas with the usual depth of infiltration associated with each. Grade I papilloma is histologically benign. Grade II is histologically malignant, but usually noninvasive, or at least confined to the mucosa. Grade III papilloma is a highly malignant lesion, with invasion well into the muscularis and sometimes into the perivesical tissues. In the presence of Grade IV lesions all of the adjacent structures are usually infiltrated.

Unfortunately there are numerous exceptions to the foregoing generalizations. Occasionally one finds a Grade II papillary carcinoma with extensive infiltration and metastasis. On the other hand, a Grade IV carcinoma may be limited to a small localized vesical area, presenting itself as a resectable lesion. The grade of a bladder tumor represents its histologic appearance, and this does not necessarily parallel

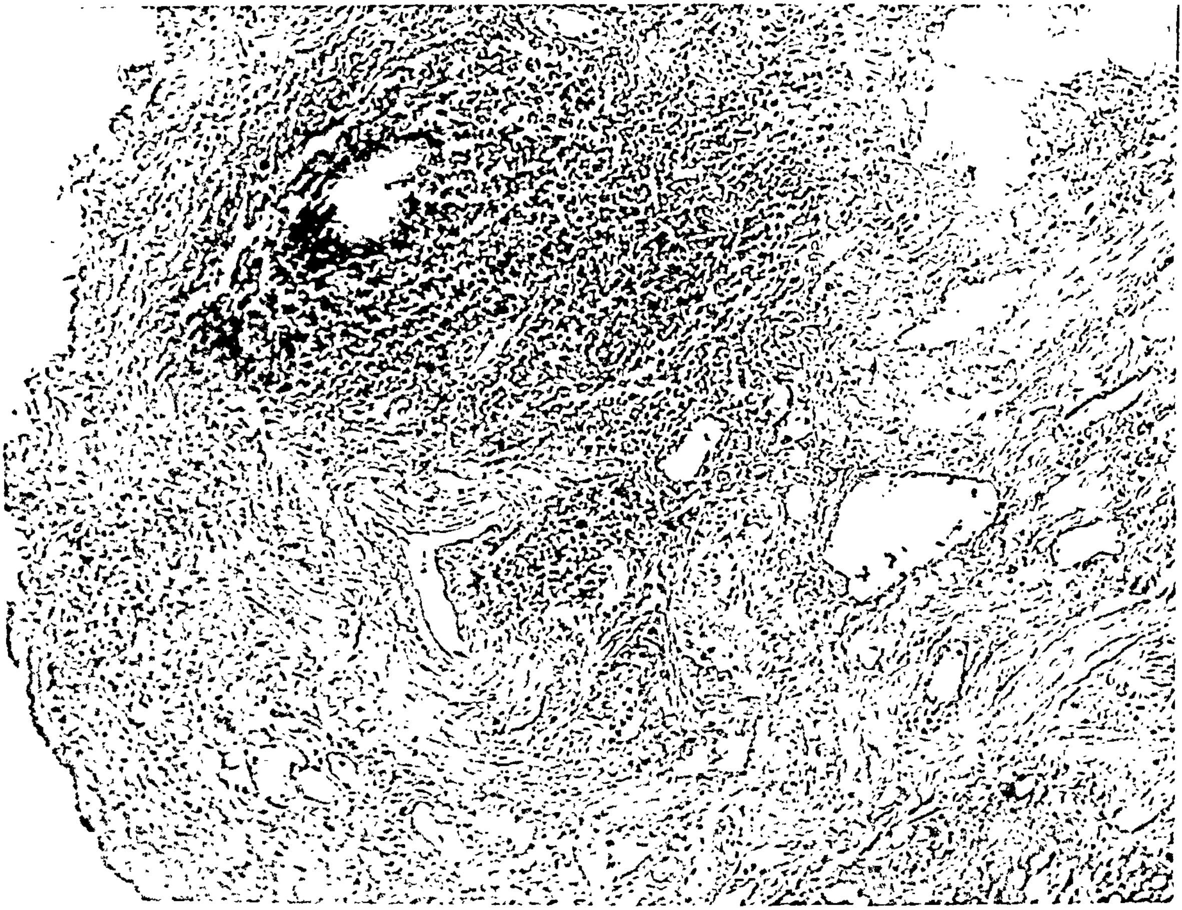

Fig. 5.—Cystitis follicularis.

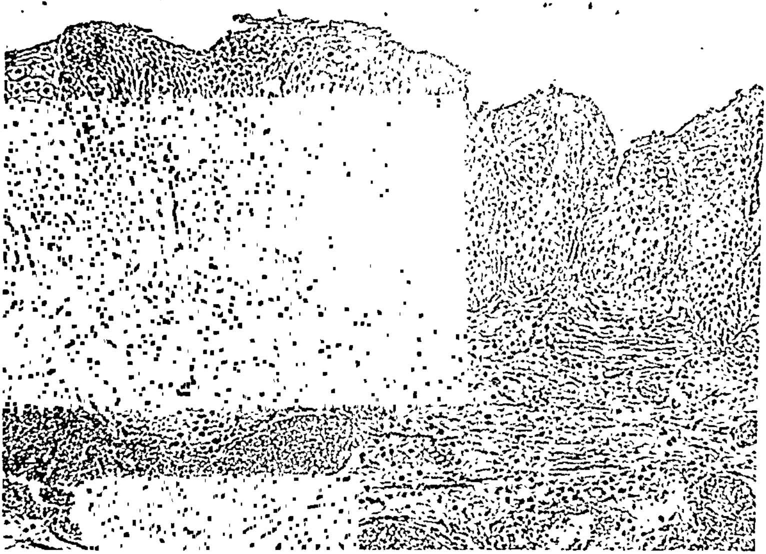

Fig. 6.—Squamous cell metaplasia of the mucous membrane of the urinary bladder.

the depth of the tumor's infiltration.

The majority of patients with vesical tumors present themselves for examination because of painless, gross hematuria. In Milner's[4] study of 245 cases, hematuria was the first symptom in 94 per cent. Higgins[1] stated that hematuria is the presenting symptom in 79 to 85 per cent of all cases of carcinoma of the bladder. In our series of 58 patients, 44, or 76 per cent, were first examined because of gross hematuria. The remaining 14 sought medical care because of dysuria, frequency, urgency, stranguria or ureteral pain, and the bladder tumor was discovered incidentally.

The associated urologic diagnoses in this group of 14 patients are shown in Table 2.

TABLE 2.—*Urologic Diagnoses*

Associated Urologic Diagnoses	*No. of Cases*
Benign prostatic hypertrophy	7
Urethral obstruction in female patients	3
Persistent urethral discharge in a male patient	1
Ureteral colic	3
Total	14

Unless a bladder tumor is discovered during a cystoscopic study performed for other reasons, it will eventually bleed. Unfortunately all bladder tumors do not bleed early in their course. Table 3 represents an attempt to find out whether delay in seeking medical care resulted in progress of the disease to an advanced stage. It shows a tendency in that direction, though it is not pronounced.

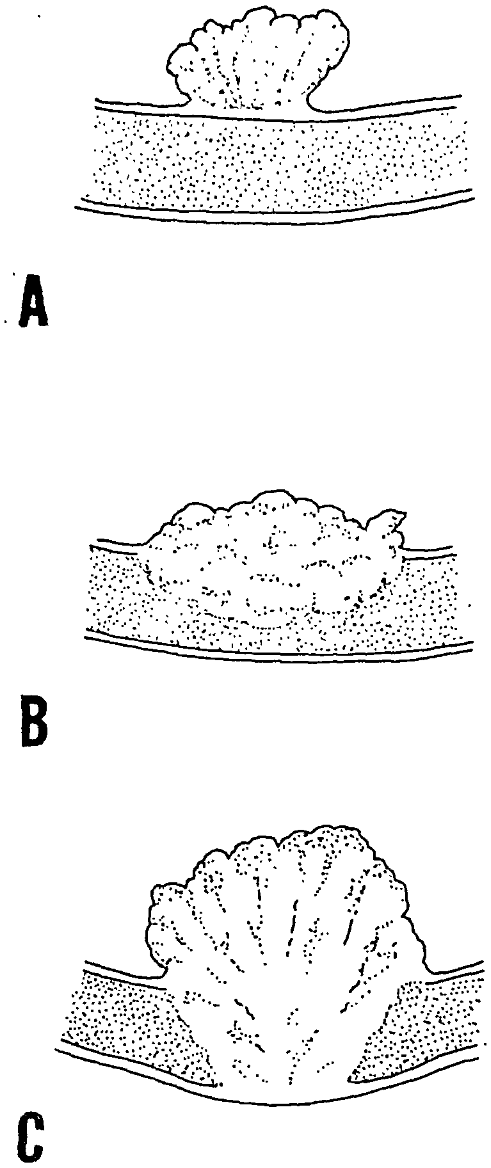

Fig. 7.— Jewett and Strong's classification of vesical neoplasms, based on the depth of infiltration.

Treatment of vesical tumors should be undertaken with the thought in mind that all are potentially malignant. The benign papilloma probably does exist. The work of Deming[3] and others serves to prove this point. In a study of 109 histologically benign papillomas he found that only 8, or 7.3 per cent, became malignant. The tissue submitted for histologic study may not be representative of all the changes in a tumor, and, unless one goes deep into the muscularis, information will not be obtained concerning the degree of infiltration.

Dean[11] stated: "The time has passed for advocating any single form of treatment for all bladder tumors, because experience has shown that all accepted treatments have usefulness which varies in degree with different conditions in the bladder and urinary tract. Arguments should no longer occur between proponents of radiation or radical surgery because the greatest value of these important agents is demonstrated in different clinical conditions. To produce the best results the urologist must be capable of utilizing all forms of therapy, either alone or in combination so that he may choose from the now somewhat extensive armamentarium, proper treatment for each patient."

Table 4 lists the various treatments we have used and our indications for their use. We reserve transurethral resection and fulguration for (a) obtaining biopsy material, (b) treating single and multiple papillomas of low malignancy and with a narrow stalk, and (c) control of bleeding in certain cases. We agree with Dean when he limits to 15 the number of papillomas that can be safely treated by electrocoagulation in a single patient. In all cases, regardless of the cystoscopic appearance of the tumor, a biopsy is neces-

TABLE 3.—*Relation of Duration of Symptoms to Grade of Malignancy in a Study of 55 Cases of Malignant Disease of the Urinary Bladder*

Duration of Symptoms	Grade of Malignancy I	II	III	IV	Totals	%
One month or less	4	9	11	4	28	51%
One month to 1 yr.......	3	1	10	2	16	29%
Over one year	0	5	2	4	11	20%
Totals ..	7	15	23	10	55	—
%	13%	27.2%	41.7%	18.1%	—	100%

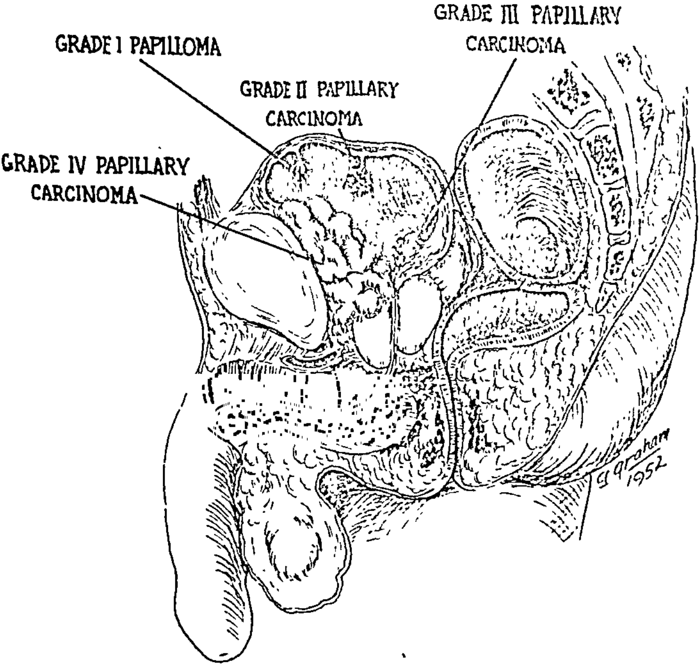
GRADE III PAPILLARY CARCINOMA
GRADE I PAPILLOMA
GRADE II PAPILLARY CARCINOMA
GRADE IV PAPILLARY CARCINOMA
G. Graham 1952

Fig. 8.—Semidiagrammatic drawing of the various grades of papillary carcinoma, showing the usual depth of infiltration of each grade.

sary, and we prefer to take the specimen with the resectoscope. Our preference in instruments is the Nesbit modification of the Stern-McCarthy resectoscope. With use of the newer electrosurgical units with an undampened "tube" cutting current, and with the power turned down as low as possible, there will be very little change in the removed tissue attributable to the electric cutting current. The tissue changes are usually limited to a few layers of cells adjacent to the cut. The taking of deep bites of tissue further insures good biopsy material. In taking the biopsy specimen, we try to remove all of the lesion. In addition to obtaining the tissue from the lesion, it is important in determining the degree of infiltration to obtain tissue from the periphery of the base and from deep in the muscularis beneath the base. This tissue should be sent to the pathologist as three separate specimens from the same lesion, labeled "tumor," "periphery," and "base." If several tumors are present, the tissue from each should be studied separately.

TABLE 4.—*Author's Indications for Employment of Various Therapeutic Procedures in Treatment of Malignant Vesical Disease*

1. Transurethral resection and fulguration
   a. For single or multiple papillary tumors of low grade (I or II) malignancy and without infiltration into the muscularis

2. Transurethral resection, fulguration, and implantation of radon seeds
   a. For recurrence of tumors mentioned under 1 a
   b. For poor surgical risks with tumors of higher degrees of malignancy and some degree of infiltration of the muscularis

3. High voltage roentgen therapy
   a. For palliative procedures—otherwise we do not recommend its use. It is seldom effective and often results in a small, contracted, painful bladder

4. Suprapubic cystotomy and fulguration
   a. For the tumors mentioned under 1 a that cannot be reached with the resectoscope or the fulgurating electrode

5. Suprapubic cystotomy, fulguration and implantation of radium or radon seeds
   a. For the tumors mentioned in 2 a and 2 b if inaccessible transurethrally, especially if they show a higher grade of malignancy and greater degree of infiltration

6. Partial cystectomy
   a. For operable tumors involving the upper half of the bladder. They must be primary or recurrent growths, single and nonpapillary
   b. For tumors in diverticula of the bladder

7. Total cystectomy
   a. For primary or recurrent papillary or nonpapillary tumors of the bladder with the following characteristics: (1) infiltration into, but not through, the bladder musculature; (2) medium to poor degree of microscopic differentiation; (3) in some cases, infiltration through the muscularis in conjunction with a radical dissection of the perivesical iliac and aortic glands, and (4) some of the less malignant tumors in the basal area of the bladder in close proximity to the ureteral orifices or internal vesical orifice

8. Palliative management for inoperable cases when the malignant growth has extended
   a. Bilateral ureterosigmoidostomy. This is the procedure of choice both from the standpoint of both comfort of the patient and function of the upper part of the urinary tract
   b. Cutaneous ureterostomy
   c. Nephrostomy or pyelostomy
   d. Suprapubic cystotomy
   e. High voltage roentgen therapy

Dean[11] limits the use of transurethral electrocoagulation to single papillomas with bases no larger than 1 cm. in diameter, and to multiple papillomas of the same size if not more than 15 are present. In his experience, tumors exceeding these specifications are best treated by other methods.

In our opinion, when there is a recurrence of a previously resected papilloma, the therapy should be changed. If there is a marked increase in the degree of malignancy or evidence of muscular infiltration, then radical surgical intervention is indicated, but if there is little change in the degree of malignancy and no evidence, or only doubtful evidence, of infiltration into the muscularis, the lesion should again be resected, the base fulgurated and either radium or radon seeds implanted. We use radon seeds because they are available, easy to insert and nonremovable.

Dean and others[11] have recommended the transurethral use of radon seeds either with or without electrocoagulation for single papillary tumors with bases between 1 and 2.5 cm. in diameter, but insist that they be so situated that every part of the tumor can be viewed through the cystoscope. They should be at least 1.5 cm. from a ureteral orifice and 2 cm. away from the neck of the bladder. These authors emphasize the fact that infiltrating neoplasms should not be treated transurethrally, because cystoscopically one cannot detect submucosal extension of a tumor.

We do not recommend this conservative line of therapy in cases of infiltration of the tumor into the muscularis if the patient's general condition is capable of withstanding more radical treatment. In aged patients and poor surgical risks we treat even large and deeply infiltrating lesions by transurethral resection, fulguration and the implantation of radon seeds. We realize that this is only palliation, but it is about the limit of some patients' surgical tolerance.

High voltage roentgen therapy was formerly popular, but it fell into disrepute

TABLE 5.—*Treatment of Malignant Tumors of the Urinary Bladder in 58 Cases*

Treatment (a)	*Cases*		*Operative Deaths*		*Later Deaths*					*Survivals*					*Comments*
	No.	%	No.	%	No.	%	(1)	(2)	(3)	No.	%	(1)	(2)	(3)	
T.U.R. and fulguration	26	45	3	11.5	7(b)	27	2	36	15.3	16(c)	61	2	85	31.1	(b). Two underwent radical operations later but died in two to ten months. (c). One had total cystectomy nineteen months later. Is living after thirty-six months
T.U.R., fulguration and radon seeds	6	10.3	0	0	2	33	3	8	5.5	4(d)	66	6	20	13	(d). One had a recurrence in six months; was treated by T.U.R. and fulguration
T.U.R., fulguration and high voltage roentgen therapy	4	6.9	0	0	3	75	5	30	20	1	25	(e)	—	—	(e). Has had 3 recurrences but is living and well after twelve years
High voltage roentgen therapy only	1	1.7	—	—	1	100	8	—	—	0	0	—	—	—	Severe bladder pain
One-stage total cystectomy	14	24	2	11	4	28	2	36	17	8	58	3	48	29	No known recurrences among the 8 survivors
Two-stage total cystectomy	3	5.2	1(f)	33	1	33	2	—	—	1	33	70	—	—	(f). Died of obstruction of terminal portion of ileum, formerly treated by operation
Partial cystectomy and high voltage roentgen therapy	1	1.7	0	0	1	100	27	—	—	0	0	—	—	—	Adenocarcinoma of urachus
Palliative ureterosigmoidostomy	1	1.7	0	0	1	100	8	—	—	0	0	—	—	—	Obtained marked relief from pain
Palliative cutaneous ureterostomy	3	5.2	0	0	3	100	3	10	7	0	0	—	—	—	Pain relieved
Palliative suprapubic cystotomy and unilateral cutaneous ureterostomy	1	1.7	0	0	1	100	5	—	—	0	0	—	—	—	Cutaneous ureterostomy was unilateral
Palliative bilateral pyelostomy	1	1.7	0	0	1	100	2	—	—	0	0	—	—	—	Admitted with anuria and uremia

a. Includes both the initial and the later treatments given. In some cases several different types of treatment were given.

1. Shortest period, in months
2. Longest period, in months
3. Average period, in months

TABLE 6—*Analysis of 25 Deaths in a Series of 58 Cases of Malignant Disease of the Urinary Bladder*

No.	*Diagnosis*	*Sex*	*Age*	*Grading*		*Duration of Tumor from Symptoms*	*No. of Recurrences*	*Treatment Given*	*Complications of Treatment*	*Survival Period*	*Cause of Death*
				Microscopic	*Jewett's*						
1	Papillary carcinoma	F	76	III	A	1 year	0	Transurethral resection and fulguration	Cerebral hemorrhage	10 days	Cerebral hemorrhage, arteriosclerosis, generalized senility, marked
2	Papillary carcinoma	F	62	II	A	1 week	0	Transurethral resection and fulguration	None	3 years	Cardiac-coronary occlusion
3	Papillary carcinoma	F	62	IV	C	2 months	0	Transurethral resection and fulguration	Further treatment refused	7 months	Died at home, presumably from the carcinoma
4	Papillary carcinoma, multiple	M	73	III	B	1 month	0	Transurethral resection and fulguration	None	20 months	Cerebral hemorrage with hemiplegia
5	Papillary carcinoma	M	70	II	A	3 years	0	Transurethral resection and fulguration	None	17 months	Cardiac-coronary occlusion
6	Papillary carcinoma	M	70	III	B	2 days	0	Transurethral resection and fulguration	Cerebral hemorrhage with hemiplegia	48 hours	Cerebral hemorrhage with hemiplegia
7	Large carcinoma, base of bladder	F	75	IV	C	2 months	0	Transurethral resection; fulguration; 7 radon seeds of 2.5 mc. hours each	Progressive invalidism	3 months	Died at home, presumably from the carcinoma. She was senile and very feeble
8	Papillary carcinoma, multiple	M	79	II	B	3 years	8	Transurethral resection and fulguration 8 times; radon seeds (6, 2.5 mc. hours) seventh time	Small, contracted and painful bladder	2 weeks after eighth fulguration	Died in uremic coma 2 weeks after eighth fulguration and 3 months after use of radon seeds. He probably had metastasis
9	Squamous cell carcinoma	F	68	IV	C	1 month	0	Right nephrectomy for pyonephrosis; transurethral resection and fulguration; high voltage roentgen therapy	Small, contracted and painful bladder	5 months	Generalized carcinomatosis
10	Papillary carcinoma, multiple	M	52	III	B	10 days	0	One-stage cystectomy and ureterosigmoidostomy	Intestinal obstruction (volvulus of ileum) 7 months after cystectomy	7 months	Died following operation for intestinal obstruction. There was no evidence of recurrence of carcinoma

TABLE 6 *(Cont'd.).—Analysis of 25 Deaths in a Series of 58 Cases of Malignant Disease of the Urinary Bladder*

11	Papillary carcinoma	M	63	III	B	1 year	0	One-stage cystectomy and ureterosigmoidostomy	Fluid, acid-base imbalance; excretory urograms made prior to onset of uremia were normal on left; on right there was a Grade I hydronephrosis	23 months	Uremia. No evidence of recurrence of carcinoma
12	Large carcinoma	M	68	II	B	1 month	0	Left nephrectomy for large branched calculus 6 months prior to one-stage total cystectomy and right ureterosigmoidostomy	Failed to react after operation and died on third day	3 days	Circulatory collapse
13	Papillary carcinoma	M	58	II	B	2 weeks	1	Transurethral resection and fulguration; recurrence 9 months later and then total cystectomy and bilateral ureterosigmoidostomy	Marked abdominal distortion for 10 days after cystectomy	2 months	Died at home of coronary occlusion
14	Large carcinoma	M	71	III	B	1 month	0	One-stage cystectomy and bilateral ureterosigmoidostomy	Massive pulmonary embolism	1 week	Pulmonary embolism
15	Papillary carcinoma	M	71	III	B	1 month	0	One-stage cystectomy and bilateral ureterosigmoidostomy	None	3 years	Died after operation for low intestinal obstruction (performed elsewhere), pathologist reported no evidence of recurrence of carcinoma
16	Papillary carcinoma	M	68	III	B	7 years	6	Transurethral resection and fulguration 6 times; two-stage cystectomy and bilateral ureterosigmoidostomy	Intestinal obstruction (terminal ileum at site of previous resection)	3 weeks	Died after resection of terminal ileum
17	Papillary carcinoma	M	56	III	B	1 month	0	Two-stage cystectomy	Acid-base imbalance	[illegible]	[illegible]

TABLE 6 (*Cont'd.*).—*Analysis of 25 Deaths in a Series of 58 Cases of Malignant Disease of the Urinary Bladder*

18	Adenocarcinoma of urachus	M	79	III	B	4 months	1	Subtotal cystectomy; high voltage roentgen therapy	Recurrence in 14 months, followed by repeated and severe hemorrhages	19 months	Died at home; generalized carcinomatosis
19	Papillary carcinoma	M	65	II	B	3 years	1	Transurethral resection and fulguration; high voltage roentgen therapy; bilateral cutaneous ureterostomy for palliation	Pain and hemorrhage relieved by cutaneous ureterostomy	19 months	Carcinomatosis
20	Papillary carcinoma	F	66	IV	C	5 yrs.	Many	Transurethral resection and fulguration; high voltage roentgen therapy; bilateral cutaneous ureterostomy for palliation	Pain and hemorrhage relieved by cutaneous ureterostomy	3 months after cutaneous ureterostomy	Carcinomatosis
21	Papillary carcinoma	M	67	III	B	4 years	1	Transurethral resection and fulguration; 14 months later, bilateral cutaneous ureterostomy	Recurred in 14 months, after which cutaneous ureterostomy was done	10 months after cutaneous ureterostomy	Carcinomatosis
22	Large carcinoma filling bladder	M	60	IV	C	6 years	0	Suprapubic cystectomy and left cutaneous ureterostomy; high voltage roentgen therapy	Progressive deterioration; no pain	5 months after cutaneous ureterostomy	Carcinomatosis
23	Papillary carcinoma	M	64	II	B	3 years	3	Transurethral resection and fulguration; high voltage roentgen therapy; 18 months later, palliative ureterosigmoidostomy	Progressive deterioration; no pain	11 months after ureterosigmoidostomy	Carcinomatosis
24	Adenocarcinoma	F	72	IV	C	3 weeks	0	High voltage roentgen therapy	Severe pain in bladder	8 months	Carcinomatosis
25	Papillary carcinoma	F	39?	IV	C	1 month	0	Bilateral pyelostomy for relief of bilateral ureteral obstruction	Uremia and secondary anemia	6 weeks	Carcinomatosis

Pathologic report:
From Jewett and Strong, J. Urol. 55:300-372
Group A: Submucosal infiltration
Group B: Muscular infiltration
Group C: Vesical infiltration
Degree of infiltration estimated by cystoscopic appearance and palpation of tumor through rectum or vagina.

Total cases: 58
Total death: 25
Mortality rate: 43.1 per cent

Period of survival or observation:
Shortest: 2 days
Longest: 12 years
Average: 21.6 months, or 1.76 years

because of the high incidence of complications and its relative ineffectiveness. We seldom use it, employing it only occasionally as a palliative procedure in the treatment of very poor surgical risks. It is very important that these patients be closely supervised throughout their course of therapy so that they do not become exhausted or that severe rectal and vesical pain does not develop. In some cases there is a satisfactory regression in the size of the tumor, and a temporary improvement in the patient's condition is noted. As complications of high voltage roentgen therapy we have encountered irradiation cystitis and proctitis, lower ureteral stenosis, and vesicovaginal and vesicorectal fistulas.

Contact roentgen therapy with the Chaoul tube has been reported as successfully controlling some bladder tumors, but probably these lesions could be treated successfully with radon seeds or by segmental resection of the bladder.

Suprapubic cystotomy and fulguration without the use of radium or radon seeds is seldom used today, but when used in conjunction with radium or radon seeds it is a valuable therapeutic procedure for benign papilloma and noninfiltrating papilloma or carcinoma located in areas of the bladder difficult to visualize with transurethral instruments. This procedure is also indicated for some patients with infiltrating carcinoma if they are not acceptable risks for either total or partial cystectomy. Dean,[10] Flocks[7] and others have recommended the procedure for papillomas too large or unfavorably situated for transurethral treatment, and also for flat, infiltrating carcinomas no larger than 3 cm. in diameter. They have emphasized the fact that radium or radon seeds cannot be placed too close to a ureter. If required to do this, one should reimplant the ureter into the bladder.

Partial cystectomy is the ideal treatment in all cases in which one can successfully remove all of the neoplasm. This limits its use to the nonpapillary carcinomas in the upper portions of the bladder that are not infiltrated completely through the bladder wall. The recognized tendency of papillary tumors to recur in other areas makes them unsuitable for segmental cystectomy. Tumors in the basal area of the bladder cannot be widely excised without reimplantation of the ureter. This is a relatively easy procedure, but experience has shown that partial resection seldom removes all of the disease when the tumor involves the trigone. A zone of normal bladder wall 1.5 cm. wide should be removed with the tumor. Carcinomas infiltrated through the bladder wall are usually considered inoperable, and therapy should be directed toward palliation.

The indications for total cystectomy are controversial, but in general will include the infiltrating carcinomas that are operable and cannot or should not be extirpated by partial cystectomy. Our indications are:

1. The presence of noninfiltrating papillary tumors, regardless of the degree of malignancy, that recur after transurethral resection and fulguration faster than we can destroy them. With the first recurrence we usually implant radon seeds in addition to transurethral resection and fulguration. During the ensuing months or years, if the tumors recur greater in size and number than the lesions initially observed, we should probably recommend cystectomy.

2. The presence of any or all papillary carcinomas with infiltration into the muscularis, if operable and the patient is a suitable surgical risk.

3. The presence of nonpapillary carcinomas with muscular infiltration, and involving the basal area of the bladder.

4. In some cases, the presence of carcinoma with infiltration through the bladder wall in conjunction with a radical resection of the perivesical, iliac and aortic lymphatics. Leadbetter and Cooper[12] have discussed this, giving their technic and a detailed anatomic study of the lymph drainage from the bladder. They estimate that between 20 and 30 per cent of all malignant tumors of the bladder are ri-

vesical when first seen. The value of their radical procedure will have to await future evaluation, but it is promising.

Table 5 is a statistical study of 58 of our cases to show the results of the various treatments used. In 26, or 45 per cent, of the cases the patients were treated by transurethral resection and fulguration only. The neoplasms in these cases were benign or only slightly malignant, and the survival rate over an average period of thirty-one and one-tenth months is 61 per cent. Three of these patients later underwent total cystectomy because of recurrences with infiltration into the muscularis.

The 6 cases in which radon seeds were implanted constitute too small a group from which to draw conclusions. The 2 deaths occurred in cases of advanced disease in which the therapy was intended to be palliative only. The treatment was of doubtful value. The 4 cases in which high voltage roentgen therapy was used as an adjunct to transurethral resection of the tumor is too small a group to be significant. In 1 case the tumors were histologically benign. The patient, a man, is living and well after twelve years. In the other cases the lesion was advanced and the high voltage roentgen therapy was given as a palliative measure. The 1 patient treated by this type of therapy only was beyond hope when first seen. All patients receiving high voltage roentgen therapy suffered considerable pain in the vesical region.

There were 6 deaths in the 14 cases in which one-stage cystectomy was performed. Two were operative deaths, resulting in a rather high mortality rate of 14 per cent. The 4 patients who died later, after having survived for an average postoperative period of seventeen months, showed no evidence of recurrence of the carcinoma. In this group, 1 death resulted from an unsatisfactory ureterosigmoidostomy and 1 from coronary thrombosis; the other 2 followed surgical procedures for the relief of intestinal obstruction. The 8 patients surviving for an average period of twenty-nine months are apparently cancer-free, but for some of them the period of observation is too short to justify optimism. We expect that our final results will compare favorably with those of Marshall and Whitemore.[5] In a series of 100, they reported 26 two-year to eight-year survivals in a series of 100 after cystectomy.

Multiple-stage cystectomies are undesirable. With proper selection of cases, adequate preparation, good anesthesia and proper surgical technic it should seldom be necessary to resort to multiple stages in handling this problem.

Considering the various surgical procedures available for the relief of the distressing symptoms of advanced and inoperable carcinoma of the bladder, we prefer some method of diverting the urine from the upper part of the urinary tract. Ureterosigmoidostomy is the most desirable method, but in some cases cutaneous ureterostomy or bilateral pyelostomy or nephrostomy should be employed. The employment of surgical measures for the palliation of incurable carcinoma of the urinary bladder is justified by the observation that many of the patients so treated live for many months in relative comfort.

Table 6 is an analysis of the 25 deaths in this series of 58 patients. The mortality rate is 43.1 per cent for a period varying from two days to twelve years but averaging twenty-one and six-tenths months.

In 7 of these cases there was perivesical involvement (Jewett type C) when the patients were first seen, so treatment was palliative. In 18 of this group of 25 deaths the lesions were classified as Jewett type A or B. Six of these patients died of carcinoma. The remaining 12 died of other causes. The average age of this group of 25 deceased patients was 65 years, so the high death rate from nonmalignant causes is not too surprising.

SUMMARY

Table 7 summarizes the data resulting from this study, showing selection and treatment, with the expected results.

The authors wish to reemphasize the

importance of hematuria as the earliest symptom of vesical tumor. Cystoscopic examination is indicated for every patient with either gross or microscopic hematuria.

ZUSAMMENFASSUNG

Die Ergebnisse dieser Arbeit sind in Abbildung No. 14 zusammengefasst, wo die Auswahl der Faelle, die Behandlung und die zu erwartenden Resultate dargelegt werden.

Die Verfasser betonen von neuem die Wichtigkeit der Haematurie als fruehestes Zeichen einer Blasengeschwulst. Bei jedem Kranken mit makroskopischer oder mikroskopischer Haematurie ist die Zystoskopie indiziert.

RESUMEN

La figura 14 resume los datos resultantes de este estudio, mostrando la selección y tratamiento con los resultados esperados.

Los autores desean recalcar la importancia de la hematuria como primer síntoma de tumor vesical. El exámen cistoscópico esta indicado en cualquier paciente con hematuria macroscópica ó microscópica.

SUMÁRIO

O quadro no. 14 sintetista os principais dados colhidos nêste estudo, demonstrando a seleção e o tratamento, com os resultados verificados.

Desejal os autôres salientar a importancia da hematuria como sintôma inicial do tumôr vesical. A cistoscopia é indicada para todos os cases sejam de hematuria pronunciada ou de hematuria microscopica.

RÉSUMÉ

La figure 14 résume les données de ce travail avec le choix du traitement et les résultats obtenus. Les auteurs insistent sur l'importance de l'hématurie comme symptôme initial d'une tumeur de vessie. La cystoscopie s'impose d'emblée pour tout patient présentant de l'hématurie *macroscopique ou microscopique.*

RIASSUNTO

La figura 14 riassume i dati dello studio, mostrando assieme tipo di cura e risultati.

L'autore intende riaffermare l'importanza dell'ematuria come segno precocissimo di tumore vescicale. La cistoscopia è indicata in ogni caso di ematuria, macro- o microscopica che sia.

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Prevention of Iatrogenic Trauma in Otolaryngology

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SURGICAL progress has reached tremendous heights of mechanical perfection. All surgical fields have been aided by superior preparation of those practicing the art, as well as the important adjuvants of a greater knowledge of preoperative and postoperative care, improved technics of anesthesia and the support of blood and blood substitutes. While antibiotics and chemotherapy are fully acknowledged as making possible recoveries from infections hitherto considered fatal, they are not to be considered as substitutes for careful and adequately performed surgical procedures.

Historically, one can refer to the past decade as a period of medical revolution, because antibiotics have increased the therapeutic index of safety. However, it is the opinion of F. R. Cole[1] that the casual attitude taken by the profession in the application of these drugs has been most astonishing. He has expressed the opinion that there has been a slow deterioration of diagnosis and observation of the patient, both in the ranks of the specialist and the general practitioner. The broad spectrum of bacteriocidal properties of antibiotics have given the physician an almost devil-may-care attitude in the treatment of many diseases. The diagnostic necessities have not changed with the onset and preparation of the newer drugs, except that the use of antibiotics has frequently distorted the presenting symptoms of the patient as well as the objective data on the disease entity.

Since primitive technical methods have given way to the surgical advances of the mid-twentieth century, the avalanche of progress has been somewhat overwhelming. The juggernaut of supply and demand, together with present-day economics, has produced an era of vanishing personal contacts of physician and patient. Medicine is moving in new directions, in spite of the fact that educators are emphasizing the need for the attitude of the doctor of tomorrow to be allied to the spirit of the beloved family doctor. Page[2] expressed the wish that he be "a practitioner of constructive medicine, a scientist trained in considering man as a whole human being" and that he should understand man's physiology and psychology and know that changes in man himself have a way of reacting on his whole environment. Surely, the best planning against disaster is based on the realization that a disease, though it may be limited morphologically to a tissue, actually does not only affect the normal function of the entire organism, but also may set in motion a subtle progression of crises, psychologic, sociologic and economic, extending far beyond the physical condition of the sick person.

Reassessment of the role of the physician for good or for evil has been rekindled by Ebaugh,[3] who introduced a useful as well as meaningful term in setting forth the dictionary definition[4] which states that "iatrogenic illnesses are those disorders unwittingly induced in the patient by the physician, based on the physician's examination, manner and discussion." *Iatros* is derived from the Greek and means physician or therapy and the term "iatrogenesis" implies the morbid state created or aggravated by the physician. It is apparent that what physicians say or think, what they fail to say or think, what they do or what they do not do may contribute vitally

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to increasing the emotional maladjustments arising from the insecurity, fear, anxiety, unhappiness or unresolved conflicts of a patient.

Recent contributions of McNeill[5] and Nicholson[6] have stressed the importance of the physician's own emotional reactions to the patient's disease, thereby influencing the latter's response to his symptoms. Means aptly stated: "If he [the physician] is to truly know his patient, he is to know and understand himself." The problem was summed up by Ebaugh[3] as resulting from three facets of ineptitude: (1) failure to recognize the existence of emotional factors in illness, a major defect in medical education emphasizing the mechanistic viewpoint; (2) inability to treat minor emotional disorders if recognized, and (3) lack of awareness of the role played by the physician's feelings, attitudes and behavior in precipitating and perpetuating illness.

Socrates, more than 2500 years ago, chided the Athenian physicians for their organistic medical attitudes and appropriately pointed out that the body could not be cured without treating the mind.[3] Otolaryngology is a specialty in which one becomes especially aware of this rebuke, because the head and neck areas contain all of the special senses so readily disturbed in the course of man's earthly existence. One is not unmindful that many iatrogenic responses occur throughout the medical and surgical fields. Otolaryngology, after all, bears a kinship to each field of medicine. Since many diseases stem from a physiologic disturbance rather than from an altered anatomic picture, this is all the more important. By the same token, it is characteristic of the organistic or mechanistic school to attempt to fit the symptom to the sign (since some abnormality can be found in nearly everyone) without weighing carefully the "total patient" concept. Hollander[7] stressed the fact that an incidental observation may erroneously be considered the cause of an unrelated condition. "If the physician treats the incidental finding, he is creating a disturbance which did not exist. Moreover, he is implanting the notion that what may really be a psychogenically determined symptom is organic in origin." The prescribing of needless therapy based upon some trivial sign has left in its wake millions of troubled souls since the Socratic era.

Many personal indictments are brought about by such apparently trivial causes as the facial expression of the physician, whose look of concern or perturbation may be referable to situations irrelevant to the particular patient; his myopia, which interferes with the broader "total person" concept; his hasty or incomplete physical examinations engendered by pressure of work or outside interests; his willingness to "go along" with the patient's ideas or feelings or self-made diagnosis lest he seek help elsewhere; his indiscriminate, repetitious and long-continued use of remedial agents of dubious application; his dismissal of the patient with a diagnostic label but with no words of explanation at all or meaningless pseudoscientific verbiage that serves only to engender greater anxiety and send the patient further on in his "iatrogenic shopping tour" (Ebaugh) down the road to economic uncertainty, enforced dependence upon organistic philosophy, antagonism toward the profession in general and denunciations in the public press.

If one is to launch upon the use of remedial agents in combating these and innumerable other deficiencies of practice so that they will keep pace with technical advances, one must first admit their existence. Iatrogenic influences become manifest as the results of: (1) mistakes in diagnosis, (2) attempts to establish a diagnosis, (3) medical therapy, (4) surgical therapy, (5) psychiatric therapy or (6) general care of the patient. Such a classification, suggested by Nicholson,[6] lends itself to factual discussion.

Mistaken Diagnosis.—"To err is human," but the inhumanities resulting from diagnostic failure constitute the worst errors of medical or surgical practice. One of the outstanding reasons for their occurrence is the assumption that the doctorate in medicine not only permits but demands complete coverage of every need of the patient. The science and art of medicine is so broad that no one doctor can master all of it, and he therefore errs through ignorance. A long list of mistakes points accusing fingers at unrecorded errors of omission and commission: 1. The ulcer in the tonsillar area antibiotically treated until malignant disease was apparent even to the layman; the ulcer hidden behind the posterior pillar, in the larynx, or in the nasopharynx as the overlooked cause of an earache for which cerumen was washed out or ear drops prescribed. 2. The "stuffy nose" for which a douche or nose drops were advised, when actually a neoplasm was the etiologic factor; the same cause so frequently underlying a nosebleed previously diagnosed as simple epistaxis. 3. The otic discharge treated as so-called moist eczema of the canal or a benign suppuration of the middle ear complacently carried along on antibiotic management when actually close inspection of the tympanic membrane would have revealed an attic perforation, with the menacing specter of cholesteatoma and possible intracranial complications. 4. The discordant or hoarse voice treated with vocal rest and steam inhalations, when an indirect laryngoscopic examination might long since have disclosed the presence of a neoplasm and prevented costly delay in proper assessment of the true state of affairs. 5. The "lump in the neck," which always involves a diagnostic marathon, the primary lesion of a malignant growth often being present in the pharynx or nasopharynx. 6. A lesion in the nasopharynx, which is not uncommonly the cause of the eye discomforts of patients whose multiple corrections for errors in refraction finally and obviously become manifest at the sign of ocular paralyses (third and fourth nerves) when the neoplasm invades the cranial base and its foramens. 7. The much abused diagnostic tool, globus hystericus, which leads to mortification of both the physician and the patient when it turns out to be postcricoid carcinoma. 8 The pain in the face for which no obvious identifying signs can be detected, so that it is judged to be in the range between a hysterical manifestation and a neoplasm of the maxillary sinus and turns out to be an acoustic neurinoma when the mass has grown large enough to produce blindness; the same type of lesion, causing vertigo, often is treated for a gastrointestinal disorder and the internal ear completely ignored.

The astute, sincere clinician is seldom concerned about the condition he discovers; it is the concealed one which is a source of worry, and yet he follows the dictum of Oliver Wendell Holmes, who said, "Keep your doubts to yourself but give the patient the benefit of your experience."

All of these general examples of misdiagnosis could be completely reversed in that the diagnostic error would be in the direction of neoplasia. Too often does the physician assume that all symptoms must be explained on the basis of an organic or structural abnormality. Modern-day information via the radio, the press, the motion picture and television is effectively producing a generation of disease-oriented people who have all the classic symptoms; all the physician has to do is to fill in a few gaps, wantonly aided and abetted by a battery of laboratory tests, all very impersonal, to be sure. In themselves these many procedures, conducted under diverse environmental circumstances by personnel not always given to the simple devices of explanation, may arouse anxieties or focus attention on the complaints and make the patient sicker than he really is, especially as there is no sharp demarcation between the mental and physical aspects of the patient's nature. He is what he is or one might say what he was, because the emotional soil of the particular person was fertile or ripe for the development of such anxieties. The manner in which a physician explains some phase of his illness or complaint may be an important influence.

The physician should be discreet in what he says to the patient. If he can do no good, at least he should do no harm. Alarming information can precipitate acute anxiety. Some characteristic remarks are: "These things sometimes become cancerous" and "The brain can become affected if the infection spreads." The use of the terms "growth," "chronic" and "progressive" may likewise have disastrous effects. The fear of deterioration of special senses, mental disease, pain, old age, death, disfigurement, public censure, the loss of a job, loneliness and failure are crippling responses to emotional experiences. Many patients are the victims of unreasoning fears due to misinformation and misinterpretation.

Diagnostic Procedures.—There is an erroneous but popular concept that patients are favorably impressed by test procedures. It has already been stated that, on the contrary, there may be a fear engendered that creates invalidism and even aggravates the existing pathologic condition. One patient, a physician, had pharyngeal cancerophobia for many years. Repeated assurances by his colleagues usually were immediately nullified by a swab or a spray. Finally one of them, hoping to impress the doctor by truly scientific means, took a biopsy specimen from the region of complaint and sought to show him once and for all, under the microscope, that the tissue was "negative." The result was that the patient was more certain than ever that he was doomed, because he was convinced that some normal tissue had been substituted.

Ordering roentgenograms or barium swallow tests will have somewhat the same effect unless the physician understands his patient and explains that this is done as a mere routine of twentieth century medicine and not because "we wish to rule out a tumor." In the interpretation of a roentgen film, no such remark should ever be made as "We could find nothing wrong," which to the anxious patient only means "there is something, but they cannot see it." Murderous is the presentation of an envelope of films containing also the roentgenologist's report, which often contains such evasively protective phrases as "a suspicious mass or defect is present," or "We would like to recheck with some other views." From physician to physician there is nothing wrong with these statements, but when the report falls into the hands of a susceptible patient the end is never in sight. Histories should never be left lying around for any patient to read. A patient should never be taken into a darkroom, as is done in routine transillumination of the nasal accessory sinuses, without a brief explanation of the procedure or without an attendant. Avoidance of an "incident," whether real or imaginary, is further aided by a bit of darkroom chatter about this or that being "normal" or "clear." This will make the minutes seem like minutes, rather than years, to an anxious patient who is naturally apprehensive of the environment and the instruments to say nothing of the serious miens of those pronouncing his diagnostic sentence. Sad indeed is the response of the hard of hearing subject to an audiometric test not previously explained. The patient may regard the procedure as therapeutic and express himself as "hearing better after that new treatment."

The diagnostic term "negative" should give way to "normal," because the former is an inconclusive term. There should be less use of the modest "I think"; for the patient, "I know," without dogmatism, is much more convincing and carries with it an air of authority and a healthy finality of opinion. Should further observation be indicated or a recheck of a test be advantageous, such information should be studiously and cautiously imparted to the patient so as to avoid misinterpretation. It makes sense to have an automobile rechecked; so should it be with the enlightened patient.

Every diagnostic procedure carries with it a potential hazard, and this should be recognized and remembered. A diagnostic antrum lavage, for example, normally is performed without danger and gives valuable information in association with transillumination and/or roentgen examination. The fact remains that a periorbital swelling and even an air embolism with resultant hemiplegia are possibilities. A caloric test in the presence of a perforated tympanic membrane may precipitate acute labyrinthitis or some other intracranial complication. The unforgettable and unforgivable vertiginous experience of a caloric test or rotation response may result in an indelibly inscribed emotional disaster.

Medical Therapy.—Too little concern is usually shown over the routine "come tomorrow" repeat visit to the physician's office. Anxiety and invalidism are perpetuated by this practice, because it focuses attention on the complaint and makes the patient think he is sicker than he really is. The indiscriminate, repetitious and continuous use of drugs has the same effect. The use of nose drops is a typical example of a pernicious habit that becomes a crutch or a dependent addiction to which a physican notoriously contributes. There are well defined indications for drugs, and these should be followed. Inflation of the eustachian tube just for the sake of doing something in a case of irreversible disease of the middle or inner ear, is a flagrant violation of the patient's trust and does not comply with rational therapy. The misconception of vertigo and the popular application of a salt-free diet in lieu of a proper diagnosis, boomeranged in the instance of the subject who suddenly remembered her physician's admonition while gargling salt water. Naturally, she became violently dizzy!

Repeated irrigations of the nose and sinuses because the patient demands or encourages them are likewise not to be condoned. Assent to the patient's self-made diagnoses and requests for nasal packs or irrigations of the nose weakens, rather than strengthens, the patient's confidence in his physician. Writing for a refill of the patient's favorite prescription certainly does little to elevate the standing of the doctor and creates that "dependency strain" of Americans who carry conveniently and habitually a pocket atomizer, a nasal inhaler, nose drops and the not by any means innocuous antibiotic throat lozenges. An old aphorism, "The physician who treats himself has a fool for a patient," significantly applies to a large percentage of our lay population who can be "sold" anything if it is presented in an interesting display or if it is championed by a popular radio or television show.

Surgical Therapy.—The harmful effects of surgical procedures are not always due to mechanical failure; the patient's emotional experience may be even more crippling. As important as is the technical skill needed for total extirpation of the larynx for carcinoma, it is equally important for the surgeon to understand the meaning of the patient's loss of voice and to be able to explain it intelligently and constructively. Less time-consuming, perhaps, is the approach "Do you want to die? If not, you had better accept my recommendation!" In the presence of voice deprivation, hearing loss, facial paralysis, blindness and the mutilation of facial contour, brought about in combating life-endangering disease, the successful surgeon finds the rehabilitative processes as challenging to his skill as was the primary operation.

I have continuously attempted over a period of years to propagate the "total person" concept in my teaching as well as in approach to medical practice. It was encouraging indeed to find Glass and Hagman dwelling upon the psychologic aspects of surgery, asking that surgeons consider conscientiously the ultimate total welfare of the patient and avoid iatrogenic trauma or a fixation of symptoms, stressing the fact that the need for considering the patient's total personality increases as the absolute necessity for surgical intervention decreases. Conveniently, for the sake of discussion, they divide tions into the following types:

gency, such as a tracheotomy, time is of the essence; (2)

example, in a case of he

promptness prevails in warding off catastrophe; (3) *necessary*, as for benign growths, less urgent perhaps but indicated by the presence of a definite lesion; (4) *elective*, in the presence of a pathologic alteration, such as a deviated nasal septum, but without certainty that all symptoms will be relieved by corrective intervention; (5) *doubtful*, when long-standing deformities render the indications rather dubious, and (6) *wishful*, i. e., performed upon patients who have no objective disease but do present symptoms, which are thought to justify an operation based on (a) a "hunch" or intuitive feeling, (b) pressure from the patient or his family, or (c) the surgeon's own intolerance of inactivity, which is the causative factor in many so-called explorations. In the last three types of surgical indication the personality of the patient assumes a prominent role in the results of the operation. Furthermore, in creating invalidism and aggravating existing disease, surgery has no peer. The fact that patients subject themselves willingly to surgical treatment is no evidence for another surgical procedure; it is frequently evidence against it. Among the many reasons for this willingness, other than outright masochism, is desire for the doubtful pleasure of being an invalid upon whom are heaped all service and attention and who can govern those about him by the power of his chronic ailments.

Each surgeon who adds, unwittingly or otherwise, to the proud length of such a patient's oft-told surgical repertoire must be made aware of the fact that no suggestive therapeutic procedure, whether medical or surgical, relieves for long an underlying emotional disorder.* A recent report concerning excessive surgical intervention in hysterical patients[9] concluded that " the excess number of operations seemed neither clearly indicated nor therapeutically successful." These same authors defended what they referred to as the surgeon's "sadism." Perhaps it is the "holier than thou" position of the surgeon or, better stated, his "emotional attitude of superiority and omnipotence" that may eventually dictate compulsive surgical interference. Although confidence and boldness are cherished possessions of the surgeon, they are inadequate substitutes for experience, good judgement, study of the case at hand or inner stability unaffected by personal conflicts.

The psychiatrist may have special training in technics of analysis and guidance, but he exercises no patent rights on the God-given gift of being a good listener. Doubt is often dispelled by permitting the patient to tell his story without interruption, disapproval or moralization. Too often stress is placed upon the art of history taking as a diagnostic index of physical ills alone, but reliable information may be forthcoming, as the story unfolds, which at the same time reveals emotional factors of more than passing interest to both patient and surgeon. Surgical disaster in the form of failure to relieve the symptom or symptoms, to say nothing of sending the patient into an emotional tailspin, has been known to send the surgeon to his grave. One can but refer to the untimely death of that great otologist, Professor Gustav Alexander, who was shot and killed by a mastoidectomy patient twenty years after a previous attempt had been made on the surgeon's life. As has been suggested by Braceland,[10] a situation of this kind can be avoided by posing the question, "What do you (the patient) think this (the symptoms or sign) is doing to you?" The answer to this can be most revealing as to why the patient is reacting in this particular manner to his illness. A purely restrictive organistic approach will always fail to uncover a true psychoneurosis and may precipitate the development of one.

More emphasis is being given nowadays to the psychological preparation of the patient for surgical treatment. It is the role of the modern surgeon to offer surgical intervention not by decree but by explanation. Procedures involving children, tonsillectomy as a case in point, should be thoroughly explained, and the same holds true for the adult patient. All children have a great deal of anxiety about being in the hospital. The failure of surgeons to instruct their patients is especially important in the performance of tonsillectomy in children. If one considers the damage that tonsillectomy has caused by traumatizing children emotionally, causing them to have future states of tension and unhappiness by making them feel less whole, less able to care for themselves in a hostile world, less able to derive full benefit from the ministrations of the physician, then tonsillectomy looms as a potentially serious operation.

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*How much of this exists among the ten million operations performed in the United States every year is conjectural.

As a first requirement in the prevention of such effects, the physician ought to be honest with the child, and should be informative rather than secretive.[11] Depending upon the child's age and level of understanding, he should be told what is wrong, what the anatomic facts are, what is going to be removed, how it is going to be removed and what the effects will be. If possible, the patient should be introduced to the scene before the actual operation. When he is taken from his mother, it should be by one with whom he is acquainted rather than by a total stranger. One of the child's parents should be with him to the point of anesthesia and also immediately on his awakening. The physician should avoid anything that encourages fear and confusion.

It is possible for a successful operation to result in failure. Restoration of hearing to a practical, serviceable level may affect the patient adversely unless the patient is psychologically prepared to accept the improved function. Another bizarre response to fenestration is the resultant improved hearing on the ear not operated on.

Psychiatric Therapy.—So much psychiatry has been written of late, even for the layman, that everyone assays the role of the psychiatrist. It is true that the majority of patients have some psychogenic difficulties, at times superimposed upon organic disease. Efforts have been made to equip the nonpsychiatrist with a "therapeutic range" and convey certain "limitations." This idea may be the answer to the dearth of competent psychiatrists, but untold harm may be anticipated from such practice To many a physician it may seem simple, but to the patient it is like having a terribly traumatic surgical procedure without benefit of anesthesia. It would seem that identification of a psychic component were in the best interests of the patient, in addition to a kindly, understanding and uncritical manner. Then the patient should be referred to a competent psychiatrist who can voice an opinion as to the significance and extent of the role played by the emotional disturbance in the patient's complaints and as to whether treatment along psychiatric channels is desirable.

The question is frequently posed, "How is a patient to be referred for psychiatric evaluation?" Much depends upon the preparation of the patient for this experience. It should be done in a forthright manner, not handled casually but with patience and tact. "I am sending you to a nerve specialist," is a very poor approach which can only result in resentment toward both the psychiatrist and the referring physician. Surely many of those requesting or even insisting on elective operations should be cautiously studied.

The deviated septum in a patient which at the age of 40 suddenly produces trouble in breathing; the tonsils that, in spite of a "negative" history as to sore throat, begin to cause "that tired feeling," or the nasal deformity that is part of a variegated list of complaints, should all properly be held in abeyance by the surgeon who wishes to care for the total patient and who is interested in personal longevity. The trained psychiatrist would ferret out the prospectively psychotic patient who would do poorly after an operation, or even straighten out the emotional factors inherent in a patient with some anxiety state, thereby rendering him a better surgical risk. There may come a day in the future when a routine "manifest" of psy-

4. Es gibt keine Formeln oder festgelegte Methoden zur Verhuetung arztbedingter Krankheiten, da jeder Kranke nach seinen eigenen Gesetzen lebt.

5. In der Otolaryngologie, die mit allen Gebieten der Medizin eng verbunden ist, weiss man, welche Rolle der Chirurg spielt, der sich mit den die Sinnesorgane beherbergenden anatomischen Strukturen befasst.

6. In der heutigen Zeit, wo viele technische Schwierigkeiten und diagnostische Unklarheiten ueberwunden sind, ist man geneigt, tiefer in die Person des Kranken, der chirurgische Behandlung erfordert, einzudringen und ihn besser zu verstehen.

7. Es wird angeregt, diagnostische Untersuchungen mit Umsicht anzuwenden und den Kranken auf die notwendigen Vorgaenge mit persoenlichen Erklaerungen und mit Zuspruch vorzubereiten.

CONCLUSÕES

1. O cirurgião moderno deve estar prevenido quanto a importancia do conceito da "personalidade absoluta," num esforço para se tornar o mais eficiente possivel.

2. A salvaguarda na prevenção e na perpetuação das reações emocionais para os exames fisicos, o procedimento nos "testes" e as intervenções cirurgicas são apreciadas, de maneira que se tornem bem compreendidas e avaliadas.

3. Se si quer assegurar um completo sucesso cirúrgico ao paciente, se deve mantê-lo ao desconhecimento das influencias iatrogênicas.

4. Se cada paciente faz o regulamento por si proprio, não haverá maneira ou formula alguma que previna a iatrogênese da doença.

5. A oto-rino-laringologia está per- eitamente segura do papel do cirurgião o lidar com os dominios anatômicos, onstruindo senso especial, e levando o xemplo para todos os demais setôres da edicina.

6. Agora que as dificuldades técnicas os problemas de diagnosticos foram largamente clareados, devemos nos dedicar à maior estudo sôbre o doente que precise de um tratamento cirúrgico e de uma melhor compreensão sôbre êle ainda.

Um processo é proposto para a aplicação inteligente dos meios de diagnostico, e para a preparação do paciente através explanações verbais e sua tranquilidade de espirito.

RESUMEN

1. El cirujano moderno es sabedor de la importancia del concepto "persona total" en su esfuerzo para suministrar un cuidado total eficiente.

2. Se discuten las salvarguardias en la prevención y perpetuación de reacciones emocionales a los exámenes físicos, pruebas y operaciones quirúrgicas, de manera de que puedan ser tenidas en cuenta y puedan ser evitadas.

3. La Influencias iatrogénicas inducidas inconscientemente en el paciente aumentan de importancia si es de asegurarse el éxito quirúrgico.

4. No existe fórmula ó procedimiento establecido para prevenir la iatrogénesis de la enfermedad, cada paciente tiene una conducta propia en sí.

5. La otorinolaringoligía lleva la majestad de todas las ramas médicas y es de especial conocimiento el papel del cirujano cuando se trata de las estructuras anatómicas en las que residen los sentidos especiales.

6. Ahora que han sido contrarestadas las dificultades técnicas y perplejidades diagnósticas, la inclinación es hacia aprender más acerca del paciente que requiere tratamiento quirúrgico y entendimiento.

7. Se aboga por la aplicación inteligente de pruebas diagnósticas y por la preparación del paciente para procedimientos esenciales, por medio de la expresión verbal y la confianza establecida.

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Segmental Resection in the Surgical Treatment of Pulmonary Tuberculosis

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SEGMENTAL resection is a fairly recent development in the surgical treatment of pulmonary tuberculosis. Although the method has enjoyed increasing popularity in the management of various nontuberculous surgical lesions of the chest within the past two decades, this form of excisional pulmonary surgical intervention has been employed in patients with tuberculosis only during the past four or five years. The application of the technic of segmental resection to tuberculous lesions was initiated with some apprehension. There was grave doubt in the beginning as to whether the procedure would prove safe and satisfactory for patients with pulmonary tuberculosis. Early reports of impressive numbers of patients treated in this manner are now accumulating in the literature, and the results thus far indicate that it is a method of great promise. Our conviction that segmental resection constitutes a significant advance in the surgical management of pulmonary tuberculosis is based upon the results achieved in the 88 consecutive resections of this type performed at the U. S. Naval Hospital, St. Albans, N. Y., between April 1948 and July 1952. In this paper, the selection of patients for operation, preoperative and postoperative care, surgical complications and the early results of treatment by segmental resection will be stressed.

Tuberculosis is a protean disease, largely unpredictable in its behavior and often widespread in its distribution within the lung. These and other factors have caused excisional surgical procedures to be approached with considerable caution. Experience has emphasized the wisdom of that careful attitude. Until comparatively recently, resectional therapy for tuberculous pulmonary lesions has been considered chiefly, if not exclusively, a method of necessity. In many clinics, even today, pulmonary resection of any type is rarely elected in the definitive treatment of patients with this disease. Thus the time-honored indications for resection in cases of pulmonary tuberculosis are such conditions as thoracoplasty or pneumothorax failure, giant cavities, lower lobe cavities, destroyed lung, bronchostenosis, tuberculous bronchiectasis and certain tuberculous lesions in children. Such lesions are, in general, intractable to other forms of therapy, and excisional operation is chosen in their management for the principal reason that other forms of treatment will probably be doomed to failure. Although insufficient time has elapsed for a final assessment of results, experience to date has convinced us that *in certain well selected cases* segmental resection is superior to any other form of management, even though it might be possible to treat the patient successfully by any one of several other methods. This applies particularly to the small localized lesion, cavernous or nodular, which is confined to a single segment, or to a patient in whom the primary focus occupies a seg-

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ment and no more than one additional adjacent segment is involved.

It is not suggested that segmental resection is destined to supplant completely other therapeutic methods which have stood the test of time, nor is it proposed as a cure-all applicable to all types of tuberculous pulmonary lesions. On the contrary, there is probably no form of treatment employed in this disease that requires more discriminating judgment, more careful evaluation of the patient, better preoperative preparation, more judicious timing of the operative procedure, more meticulous operative technic, or more unremitting attention to the details of postoperative care than does segmental resection if the desired results are to be achieved.

In general, it may be stated categorically that patients do well after segmental resection who would probably have reacted favorably to other therapeutic methods. This is but another way of stating that the best results are to be anticipated in those patients who have demonstrated a relatively high degree of resistance to their disease. It is indeed the fact that they have been able to localize the tuberculous process that points them out as suitable candidates for segmental resection. One of the most attractive features of this surgical procedure lies in the conservation of healthy segments of lung. However, it was learned from early experience that, because of the apparent necessity of conserving all possible uninvolved pulmonary parenchyma in patients whose disease was extensive and widespread, to elect segmental resection was to court disaster. The employment of this technic as a last resort in an otherwise desperate situation entails great risk and offers minimal prospects of success.

What, then, are the indications for segmental resection? It can be stated simply that we have elected to employ this method because it was originally our hope, and is now our belief, that in suitably selected cases segmental resection offers the quickest, surest, least expensive and most satisfying method of bringing the patient's disease under control with a risk of complications no greater than those involved when other accepted methods of treatment are employed, if as great. Studies of pulmonary function, now being done routinely both preoperatively and postoperatively in all our operative cases of tuberculosis, strongly indicate that less functional impairment follows segmental resection than occurs when alternative surgical procedures are utilized for similar lesions. It can be definitely stated that there is no significant change in function after segmental removal of the diseased portion of lung. The studies on which this statement is based were carried out in the early postoperative period (within three months or less of the time of excisional operation). Later functional investigations in a few cases (six or more months after operation) show a trend toward actual improvement of function as compared with the preoperative status. This preservation of function by avoiding the needless sacrifice of healthy pulmonary parenchyma constitutes one of the more appealing features of the operation. Furthermore, the follow-up studies, although not yet of sufficient duration to be conclusive, suggest that the permanency of the results achieved by this method of management may well equal, if they do not actually excel, those accomplished by other forms of treatment.

Extent and Distribution of Resections.—During the period of slightly over four years covered by this report, 130 patients have been treated by excisional procedures. The extent and distribution of the resections are presented in Table 1. Patients treated by lobectomy or penumonectomy will not be considered in detail. The larger resections are included in the statistics merely to indicate the relative role that segmental operations have played in the overall program of resectional therapy for pulmonary tuberculosis in this hospital. It will be noted that the number of resections performed slightly exceeds the total number of patients treated. The explanation for this apparent discrepancy lies in the fact that multiple segmental resections were occasionally performed at one operation. In rare instances the surgical procedure consisted of a lobectomy combined with segmental resection of one or more segments of an adjacent lobe. One patient underwent bilateral segmental operations. Seven women and 80 men were treated by resection. The youngest patient was 19, the oldest 56, and the average age 33.1 years. Almost all of the patients were of the white race.

Selection of Patients for Segmental Resection.—The strong tendency of tuberculosis to affect certain segments of the lung is well known. These commonly affected segments include the apical and posterior segments of the upper lobes and the superior segments of the lower lobes. Primary foci in one or more of these common sites may pursue any of several different courses, depending upon a number of factors. These include the virulence of the organisms, the patient's innate resistance to tuberculosis, the stage of the disease in which the diagnosis is established and therapy instituted, and the efficacy of the treatment employed. Under ideal circumstances, when the diagnosis is established early and wisely selected modern therapeutic measures are instituted promptly, many such lesions will heal. In other instances the diagnosis may be made so late or the patient's resistance may be so low that extensive and widespread lesions are present before treatment is begun. In the former situation, the indications for surgical intervention do not arise. In the latter, the distribution of the disease precludes serious consideration of segmental resection as the treatment of choice. It is for patients with relatively small localized foci that the operation finds its greatest field of usefulness. It must not be inferred that the patient's lesions were always necessarily either small or localized. Many patients with rather extensive disease, whether unilateral or bilateral, may, as the result of carefully chosen and judiciously employed therapeutic methods, have their disease brought under control to a large degree, yet be left with a residual focus which is either actually or potentially hazardous. Thus many patients in this series have previously been treated by prolonged bed rest alone, bed rest combined with antibiotics, or both of those methods supplemented by temporary phrenic paralysis, artificial pneumoperitoneum, or both. Others have been managed by thoracoplasty on either the ipsilateral or the contralateral side. While still others have undergone previous excisional operations on either the same or the opposite lung.

Regardless of the means by which localization of the disease has been accomplished, the essence of the problem remains the same. It consists of so treating the patient that his clinically significant disease becomes stable and confined to one or two segments.

Preoperative Preparation.—The treatment of any patient with pulmonary tuberculosis must necessarily be individualized, and it is therefore impossible to outline a standard plan of preoperative preparation. In fact, when treatment is begun there is no means by which one may accurately predict which patients will become candidates for segmental resection, which will require more extensive surgical procedures, and which will respond satisfactorily to a conservative regimen alone. Thus certain therapeutic methods, such as a prolonged course of streptomycin combined with para-aminosalicylic acid, originally employed in the hope of arresting the disease, may ultimately prove to have been but a step in the preoperative preparation of the patient for segmental resection. The same may be said of artificial pneumoperitoneum or temporary phrenic paralysis. One may therefore speak only in general terms in discussing the preparation of a patient for segmental resection. Since this su - gical method demands a stable lesion patient is accepted for segmental re tion whose period of observation has been sufficiently long to pe ate assessment of the behavior of his disease. Obviously, tuberculosis that shows steady *regression* does not present the indications for excisional intervention, and patients whose lesions are *progressive* cannot be treated by resection with reasonable safety or anticipation of success. Every effort has therefore been made to establish stability in these patients. Carefully controlled bed rest has been routine. Although its duration has varied, few patients have been operated upon who have had less than three months of bed rest. In the average case this period has been considerably in excess of six months.

Approximately two-thirds of the first 40 patients in this series did *not* receive streptomycin either preoperatively or postoperatively, whereas in the last 48 patients it has been employed almost routinely. Our present practice is to give streptomycin to all patients in whose cases a positive bacteriologic diagnosis of tuberculosis has been made. The drug is not given to patients from whom a positive culture has not been obtained. Among the last 48 patients, as in the first group of 40, a few have been operated upon because carcinoma was suspected. Those patients did not receive streptomycin.

In passing, it is interesting to note that among the first 40 patients, the 26 who did not receive streptomycin showed no greater incidence of postoperative complications than did those who received the antibiotic, and achieved equally good results. These results do not in any way depreciate the value of streptomycin, and we should not like to have them so interpreted. The experience simply appears to indicate that segmental resection can be carried out in well selected cases with good results without the influence of streptomycin. Nevertheless, it is believed that the drug adds some degree of protection, and all patients with proved tuberculosis now receive streptomycin and para-aminosalicylic acid prior to and after excisional operations. The drug is commonly given in the dosage of 1 Gm. twice weekly, combined with para-aminosalicylic acid, 12 Gm. daily. When other indications for its use exist, it is continued without interruption from the time the therapy is instituted until the surgical program is completed. When the antibiotic is given solely because an excisional operation is contemplated, it is usually started two weeks prior to the operation. The duration of streptomycin therapy in the postoperative period depends upon the operative data and the postoperative behavior of the patient. This interval has varied from a few weeks to several months.

Numerous patients in this series have been treated by temporary phrenic paralysis, and in some instances the phrenic crush has been repeated one or more times. Even more frequently artificial pneumoperitoneum has been utilized, alone or in combination with phrenic paralysis. Pneumothorax has been employed only a few times. The ideal sought has been not only to obtain localization within a segment, or to no more than two adjacent segments, but to secure limitation of the lesion to a single well-defined focus within the involved segment. Experience indicates that in addition to well-controlled bed rest, with or without streptomycin, relaxation procedures of the types just mentioned hasten resolution of the perifocal reaction, aid in the control of small scattered foci, and generally speed the reparative processes which may so confine the patient's disease as to make him a suitable subject for segmental resection.

Operative Technic.—The technic of segmental resection will not be considered in great detail. Defining segmental resection in the broad sense as consisting of the removal of less than a lobe, three technics are available. These consist of (a) local enucleation, (b) wedge resection, and (c) anatomic segmental resection. Local enucleation is most applicable to those small, round, sharply circumscribed tuberculomatous lesions which present at a pleural surface. Wedge resection has proved a suitable method for removing similar lesions or localized nodular foci situated at or near the free margin of

TABLE 1.—*Total Number of Resections for Pulmonary Tuberculosis, 1948-1952 (130 Cases)*

Pneumonectomy	17 cases	13.1%
Lobectomy	25 cases	19.2%
Segmental resection	88 cases	67.7%
Total	130 cases	100.0%

Anatomic segmental resection	59 cases	67.0%
Wedge excision	9 cases	10.2%
Local enucleation	20 cases	22.8%
Total	88 cases	100.0%

Segmental Resection

1 *Anatomic Type*

Left Upper Lobe

Apical-posterior segment	24 cases
Posterior subsequent	3 cases
Apical-posterior and anterior segments	1 case
Accessory anterior segment	1 case

Left Lower Lobe

Superior segment	7 cases

Right Upper Lobe

Apical segment	4 cases
Posterior segment	4 cases
Apical & posterior segments	13 cases
Anterior segment	1 case
Posterior & subsegment of apical segment	1 case

Right Middle Lobe

Laterial segment	1 case

Right Lower Lobe

Superior segment	1 case

2. Wedge Excision

Left upper lobe	4 cases
Left lower lobe	2 cases
Right upper lobe	1 case
Right lower lobe	3 cases

3. Local Enucleation

Left upper lobe	2 cases
Left lower lobe	5 cases
Right upper lobe	5 cases
Right middle lobe	2 cases
Right lower lobe	6 cases

a lobe or along a fissure. We have recently abandoned the use of wedge resection because of a growing conviction that lesions suited to this technic are equally safe for local enucleation, which entails less sacrifice of healthy parenchyma and less distortion of the residual pulmonary tissue. The large majority of these patients have been managed by anatomic segmental resection. It scarcely need be mentioned that this operation requires an intimate knowledge of the anatomic nature of the bronchial tree. One must also be familiar with the vascular pattern of the various segments and aware of the common variations of the usual arrangement. The surgeon must possess the ability to recognize true anomalies of the blood supply when they are encountered.

In performing segmental resection for tuberculosis we have used principally the lateral decubitus position and commonly resect an appropriate rib, most often the fifth. In young men and in most women we have utilized an intercostal incision, entering the chest most frequently through the fourth interspace. Early in this series it was almost a routine practice to secure the bronchus before ligating any of the vessels to a segment. With increasing experience, however, we have become more confident of our ability to recognize and identify the appropriate vessels with certainty, and have adopted the general policy of freeing, ligating and dividing the arterial supply to the segment before directing attention to the bronchus. The segmental bronchus is freed, clamped and severed and the stump closed as the second step. Interrupted sutures of fine black silk are used for the primary layer of bronchial closure. Traction is exerted upon the severed bronchus and, with the aid of gentle finger dissection, the segment is stripped from its attachment to the adjacent segments. Care is exercised to carry out this stripping in the intersegmental plane, using the intersegmental vein as a guide. Branches of this vein of any significant size draining the segment that is being removed are clamped, cut and ligated as they are encountered. These are commonly very few. As the stripping proceeds, the principal veins draining the segment come into view. These are divided and ligated as they are exposed. We do not use the inflation-deflation technic to verify the identity of the segmental bronchus after it has been clamped and before it is severed. That procedure has been found to be practically useless, because of the common presence of abundant cross ventilation from adjacent segments. The surgeon must rely upon his knowledge of the anatomy of the bronchial tree to select the proper segmental bronchus. In no instance has the wrong segmental bronchus been divided. If, during the course of stripping of a segment, the disease is found to have crossed the intersegmental plane to involve an adjacent segment, the stripping is discontinued immediately and the adjoining segmental bronchus, or occasionally a subsegmental bronchus, is divided at its origin and the two segments then removed as one. By this means dissecting through grossly tuberculous parenchyma is avoided. When the segment has been removed, the pleural space is lavaged with warm sterile physiologic solution of sodium chloride. The security of the bronchial closure is tested by having the anesthetist increase the intrabronchial pressure to plus 15 cm. of water. At the same time the raw surface of the lobe is inspected for any large air leaks that may be present. Any encountered are closed with atraumatic figure-of-eight fine silk sutures. Significant bronchiolar leaks are uncommon. No attention is paid to fine parenchymal air leaks. A second layer of closure, usually consisting of pleura, is routinely applied to the bronchial stump after the security of the primary closure has been established.

After a sufficient trial we have abandoned the use of all technics designed to cover the raw surface of the lung, such as pleural tents, pleural flaps, or suturing of the pleural margins of the residual segments to each other or to the margin of an adjacent lobe. Such measures are unnecessary and may be actually detrimental because of distortion of the residual segments which must re-expand to fill the pleural space. Clotted blood at times accumulates beneath such flaps and interferes with interpretation of postoperative thoracic roentgenograms. Two thoracotomy drainage tubes are used routinely. The tip of the upper tube is secured to the pleura or periosteum of the first rib in the extreme apex of the chest and is brought out through the second intercostal space, somewhat medial to the anterior axillary line. This tube is designed primarily to remove air. The lower tube is so placed that its tip lies in the costovertebral gutter, and it is brought out through the eighth interspace in the posterior axillary line. This tube functions principally for the removal of fluid. Both tubes traverse the chest wall in an oblique manner so that air will not enter the chest when they are removed. Red rubber 30 F. rectal tubes are used. Such tubes are radiopaque; hence their position can be verified roentgenographically. They are sufficiently rigid not to collapse when high degrees of suction are employed, and their caliber is large enough to prevent their becoming plugged by blood clots or fibrin. Antibiotics, consisting of 1 Gm of streptomycin and 600,000 units of penicillin, are instilled into the pleural space just prior to closure of the chest. We have no great faith in the efficacy of these agents employed in this manner. A large percentage of the antibiotic solution is no doubt removed by suction soon after the chest is closed. There would be some advantage if small loculated or trapped collections of fluid contained the antimicrobial drugs, but in general their intrapleural use probably contributes little to the safety of the patient.

Postoperative Management.—The postoperative care of these patients rivals proper case selection as the most important contribution to success in the treatment of pulmonary tuberculosis by segmental resection. Ceaseless attention to detail is demanded. The paramount objective is to secure prompt and complete re-expansion of the residual pulmonary tissue so that total obliteration of the pleural space is achieved. This implies the prevention of atelectasis, the complete removal of all fluid collections, the withdrawal of all air from the free pleural space and the sealing of all air leaks. To